Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/9dybwd36

ASSESS THE PREVALENCE, DEMOGRAPHIC PROFILE, SEVERITY AND RISK FACTOR OF DRY EYE SYNDROME AMONG COMPUTER ENGINEERING STUDENT - A CROSS SECTIONAL STUDY

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Abstract

Background: Dry Eye Syndrome (DES) is a multifactorial disease causing ocular discomfort and visual disturbances, especially prevalent among individuals with prolonged screen time.

Objectives: To assess the prevalence, demographic profile, severity, and risk factors of DES among computer engineering students.

Methods: A cross-sectional study was conducted among 239 computer engineering students at Shri Shankaracharya Technical Campus, Bhilai. Data on demographics, screen time, physical activity, and ocular symptoms were collected using a structured questionnaire. Descriptive and inferential statistics were used to analyse the findings.

Results: DES symptoms were prevalent in the study group, with 82% reporting dryness and 85% eye fatigue. A majority (75.7%) had screen exposure exceeding 4 hours per day. Females, although fewer in number (37.2%), reported more severe symptoms. Physical activity was limited to 11.2% of participants. Symptom severity increased over time, with more individuals reporting persistent symptoms after three months.

Conclusion: Prolonged screen exposure significantly contributes to DES symptoms among students. Regular physical activity and preventive eye care practices are recommended to mitigate this growing public health issue.

Keywords: Dry Eye Syndrome, Computer Vision Syndrome, Screen Time, Ocular Symptoms, Engineering Students, Cross-sectional Study

Introduction: Dry eye is defined as a multi-factorial disease of tears and ocular surface that results in symptoms of discomfort, visual disturbance, and tears film instability with potential damage to ocular surface. It is accompanied by increased immorality of tear film and inflammation of ocular surface [1].

Dry eyes can adversely affect common tasks of daily activities such as reading, driving and negatively impact the vision-related quality of life psychological health and overall well-being [2-4]. This disease has significant economic implications, including costs associated with increased healthcare utilization, missed school or work days, adverse effect on leisure and quality of life issues [5].

Prevalence rates of (Dry Eye Syndrome)DES ranges from 5.5% -37.7% in the general population and more common in women [6]. Factors which predispose to DES include socio – demographic characteristics like age (30 - 40y), female gender, urban region; systemic and age-related diseases and medications; environmental factors like smoking and air pollution; occupational exposures to computers and use of air conditioning[6,7]. Windy environments, increased television watching and reading time have also been reported to be associated with clinical signs of DES[2]. The young to middle aged population with the dramatic increase in the amount of work undertaken using visual display terminals (VDTs) such as computer screens[8]. Visual - related problems to be the most frequently reported health related problem occurring in over 70% of computer workers. In India estimate that every 7 of 10 information technology (IT) students had eye - related problem, with females facing more burden than male [9]. Ocular problems in occupational computer users have been observed in 23% - 32% in Japan[10] and in more than 65% in various studies from India [11].

The normal tear film is made up of 3 layers (lipid, aqueous and mucin layer). The lipid layer which helps to prevent evaporation is the outer most layer. The middle layer which is also known as the aqueous layer consists of 90% water and the innermost layer, the mucin layer which helps to bind the tear film to the epithelium. A disruption in any of these layers such as tear deficiency or excessive tear evaporation could cause damage to the ocular surface and this is associated with a variety of symptoms reflecting ocular discomfort [12].

Dry eye therefore occurs when people don't have enough tears or correct composition of tears on the surface of their eyes which results in discomfort. Predisposing factors of dry eye include; advanced age, gender, certain medications, environment, workplace stress (arid atmosphere, constant wind currents), prolonged use of video display screens, and presence of contact lens [13].

Aim - To assess the prevalence, demographic profile, severity, and risk factors of DES among computer engineering students.

Objectives

- To determine the prevalence and severity of DES.
- To identify demographic and behavioural risk factors.
- To analyse associations between screen time, activity level, and symptom progression.

Methodology

Design: Cross-sectional observational study.

Setting: Shri Shankaracharya Institute of Medical Sciences, Bhilai, Chhattisgarh.

Participants: Computer engineering students aged ≥18 years.

Inclusion Criteria: Enrolled students above 18 years.

Exclusion Criteria:

- History of ocular trauma/surgery.
- Systemic diseases affecting eyes.
- Current DES treatment.
- Non-consenting individuals.

Duration: 12 months.
Sample Size: $\mathbf{n = (Z^2 \times p \times (1 - p)) / E^2}$
Where:

- n = required sample size
- Z = Z-score corresponding to the desired confidence level (1.96 for 95%)
- p = estimated prevalence (0.32, based on previous studies)
- E = margin of error (0.10)

Substituting the values into the formula:
$n = (1.96^2 \times 0.32 \times (1 - 0.32)) / 0.10^2$
$n = (3.8416 \times 0.32 \times 0.68) / 0.01$
$n = 0.8368 / 0.01$
$n \approx 83.68$
Sampling Method: Random sampling.
Data Collection: Structured questionnaire and informed consent.
Analysis: SPSS/Excel; Descriptive stats, chi-square tests, logistic regression.

Result
The study shows the age distribution of a group, with a total of 239 individuals. Out of this total, 215 individuals (representing 89.9%) are aged <20, while 24 individuals (10.1%) are >20. The gender distribution of a group of 239 individuals. Among them, 150 are male, making up 62.8% of the total, while 89 are female, accounting for 37.2%.

1. **Screen use**

Type of Screen Use	**Frequency**	**Percent**
Mobile, Laptop	171	71.6
Mobile, Laptop, Desktop	62	25.9
Mobile, Desktop	6	2.5
Total	**239**	**100.0**

Our study revealed 53.6% out of 100% student were using mobile and laptop with maximum screen time more than 4hrs (75.7%) only 11.2% student were doing physical exercise, ocular symptoms like dryness 82% irritation 50% watering 59% Eye fatiguing 85% frequency showed only 25% students have constraint symptoms.

2. **screen time**

Screen time usage		Frequency	Percent
	>4 Hours	181	75.7
	≤4 Hours	58	24.3
	Total	239	100.0

This table shows out of 239 people, 181 (75.7%) use screens for more than 4 hours, while 58 (24.3%) use them for 4 hours or less. Most people (75.7%) are on screens for a longer time.

3. Eye drops

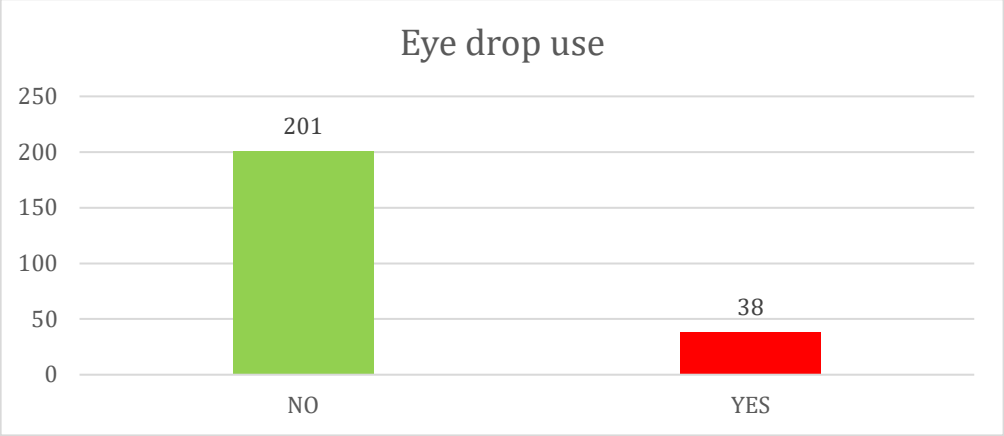
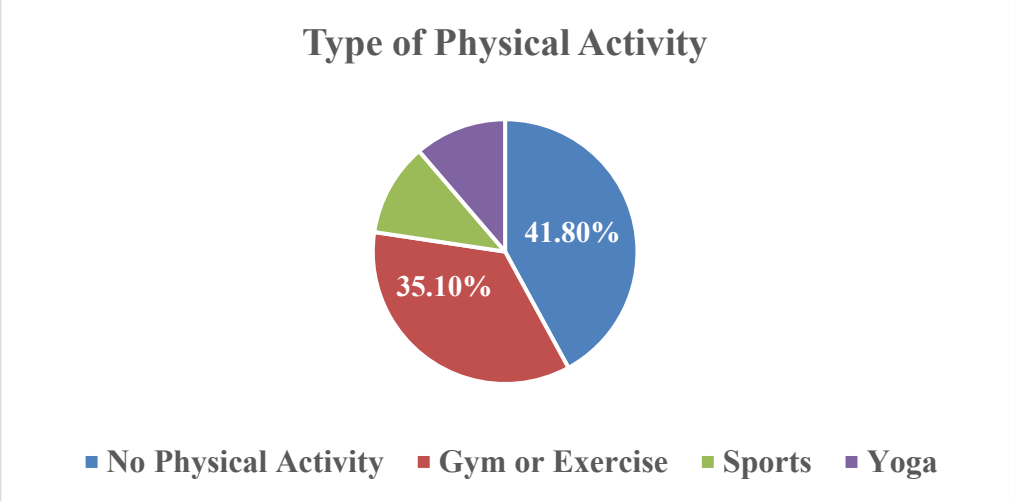


Figure shows out of the total, 201 people (shown in green) do not use eye drops, while 38 people (shown in red) do use them.

4. Physical activity



5. Ocular Manifestation

1.Report the type of Symptoms you are experiencing and when they occur			
	At this visit	**At 72 hours**	**At 3 months**
Dryness, Grittiness, or Scratchiness			
YES	66	43	82
NO	173	196	157
Soreness or Irritation			
YES	67	50	83
NO	172	189	156
Burning or watering			
YES	84	59	95
NO	155	180	144
Eye Fatigue			
YES	97	83	108
NO	142	156	131

The table shows the frequency of four eye-related symptoms at three time points: at the visit, after 72 hours, and after 3 months. Eye fatigue was most common (97, 83, 108 cases), followed by burning or

watering (84, 59, 95 cases), soreness or irritation (67, 50, 83 cases), and dryness, grittiness, or scratchiness (66, 43, 82 cases).

2. Report the frequency of the SYMPTOMS using the rating list below					
		Dryness, Grittiness, or Scratchiness	**Soreness or Irritation**	**Burning or watering**	**Eye Fatigue**
	0=Never	115	113	107	94
	1= Sometimes	97	109	98	90
	2= Often	24	16	3	47
	3= Constant	3	1	13	8

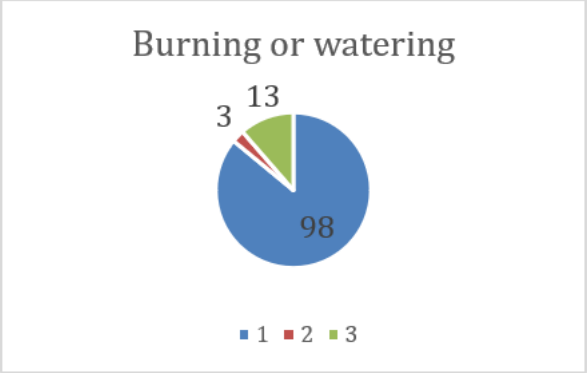


Figure showing frequency of symptoms among study participants (n-112) out of which sometimes (n-98), often (n-3), constant (n-13)

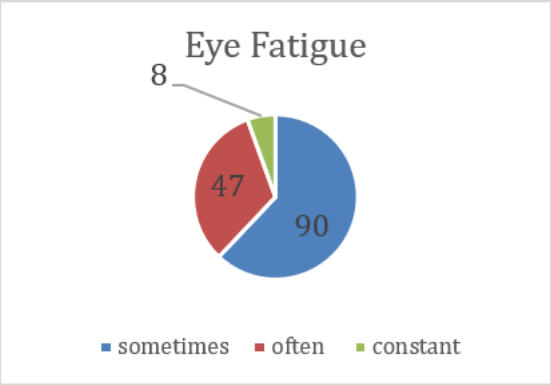


Figure showing frequency of symptoms among study participants (n-145) out of which sometimes (n-90), often (n-47), constant (n-8)

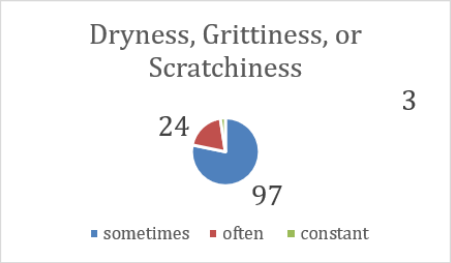


Figure showing frequency of symptoms among study participants (n-124) out of which sometimes (n-97), often (n-24), constant (n-3)

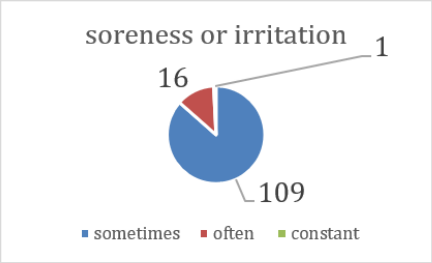


Figure showing frequency of symptoms among study participants (n-126) out of which sometimes (n-109), often (n-16), constant (n-1)

3. Report the SEVERITY of your SYMPTOMS using the rating list below					
		Dryness, Grittiness, or Scratchiness	**Soreness or Irritation**	**Burning or watering**	**Eye Fatigue**
	0=Never	154	138	133	111
	1= Sometimes	58	80	78	87
	2= Often	18	12	20	32
	3= Constant	9	9	8	9

The data highlights the severity of four eye-related symptoms on a scale from 0 (Never) to 3 (Constant). Dryness, grittiness, or scratchiness was never experienced by 154 individuals, sometimes by 58, often by 18, and constantly by 9. Soreness or irritation followed with 138, 80, 12, and 9 cases, respectively. Burning or watering was reported by 133, 78, 20, and 8 individuals, while eye fatigue affected 111, 87, 32, and 9 individuals, respectively.

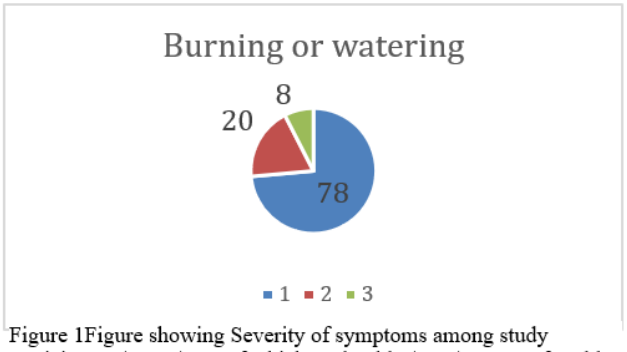


Figure 1Figure showing Severity of symptoms among study participants (n-106) out of which. Tolerable (n-78), Uncomfortable (n-20), Intolerable (n-8)

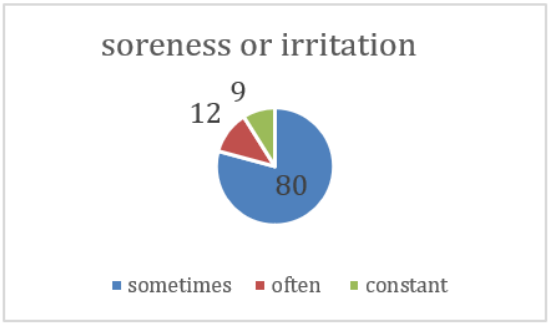


Figure 2Figure showing Severity of symptoms among study participants (n-85) out of which. Tolerable (n-80), Uncomfortable (n-12), Intolerable (n-9)

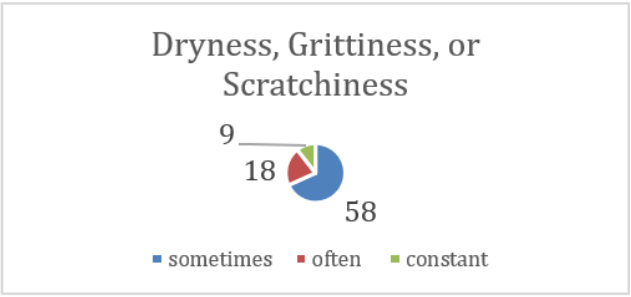


Figure 4Figure showing Severity of symptoms among study participants (n-85) out of which. Tolerable (n-58), Uncomfortable (n-18), Intolerable (n-9)

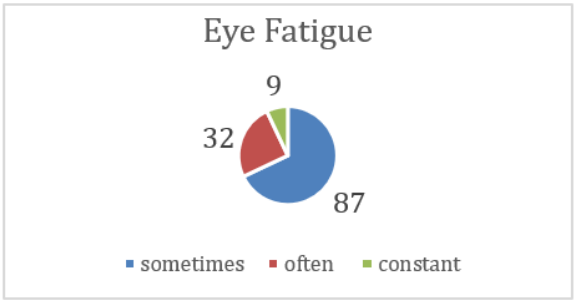


Figure 3Figure showing Severity of symptoms among study participants (n-128) out of which. Tolerable (n-87), Uncomfortable (n-32), Intolerable (n-9)

Discussion

This study assessed the prevalence, demographic distribution, and risk factors of Dry Eye Syndrome (DES) among computer engineering students. Our findings indicate a high prevalence of ocular discomfort, with 82% reporting dryness, 85% experiencing eye fatigue, and 50% reporting irritation. The prolonged screen time (>4 hours in 75.7% of participants) was a significant contributor to these symptoms, aligning with previous studies emphasizing the impact of Visual Display Terminal (VDT) use on ocular health.

A study by Uchino et al. 2013 [14] reported a prevalence of DES between 23%-32% among occupational computer users in Japan, which is lower than our study findings. However, Indian studies have found higher rates of computer-related ocular complaints, exceeding 65%, supporting our results. Bansal et al. 2013 [15] found that 70% of IT students experienced eye-related symptoms, with a higher burden among females, similar to our observation that 37.2% of participants were female, yet they exhibited more severe symptoms.

Our study highlighted the inverse relationship between screen time and physical activity. Only 11.2% of students engaged in regular exercise, while a majority (75.7%) spent more than 4 hours on screens daily. This sedentary behavior is concerning, as studies by Yamada et al. 2012 [16] show a strong correlation between reduced physical activity and worsened DES symptoms, emphasizing the importance of exercise in preventing ocular discomfort.

Interestingly, our follow-up data revealed that eye fatigue and dryness worsened over three months, indicating that prolonged screen exposure leads to cumulative eye strain. Shrivastava & Bobhate 2012

[17] reported a similar trend, where symptoms of irritation and dryness intensified over time due to sustained computer use.

Conclusion

The data reflects the frequency and severity of four eye-related symptoms—dryness, grittiness or scratchiness, soreness or irritation, burning or watering, and eye fatigue—reported at three different time points and rated on a scale from 0 (Never) to 3 (Constant). Dryness, grittiness, or scratchiness was reported by 66 individuals at the visit, decreasing to 43 at 72 hours but rising to 82 after 3 months. Soreness or irritation followed a similar pattern, with 67 individuals at the visit, 50 at 72 hours, and 83 at 3 months. Burning or watering symptoms fluctuated, reported by 84 at the visit, 59 at 72 hours, and 95 at 3 months. Eye fatigue was the most commonly reported symptom, increasing from 97 at the visit to 108 at 3 months. The majority of individuals rated their symptoms as either "Never" or "Sometimes," with fewer experiencing them "Often" or "Constantly" over time.

Limitation

- **Sample Specificity**: Limited to one institution and discipline.
- **Self-Reported Data**: Potential bias.
- **Cross-Sectional Design**: Limits causal inference.
- **Lack of Objective Tests**: No TBUT or Schirmer's testing.
- **Uncontrolled Confounders**: Environmental and dietary factors not analysed.

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