RJNMSR
Review Journal of Neurological & Medical Sciences Review

Volume 4, Issue 6, 2026

INVESTIGATING THE BURDEN AND RISK FACTORS OF DRY EYE SYNDROME AMONG COMPUTER ENGINEERING UNDERGRADUATES STUDENTS IN PAKISTAN: A CROSS-SECTIONAL STUDY

Yasin Mahmood[*1], Aamir Asif[2], Muhammad Usman[3]

[*1,2]*Rehman College of Allied Health Sciences, Rehman Medical Institute, Peshawar, Pakistan*
[3]*Eye Care Services Program, Merged Areas, Warsak Road, Peshawar, Pakistan*

[*1]yaseenmahmood96@gmail.com

Corresponding Author: *
Yasin Mahmood
DOI:https://doi.org/10.5281/zenodo.20826937

Received	Accepted	Published
26 April 2026	08 June 2026	21 June 2026

ABSTRACT

Background: *Eye syndrome encompassing dry eye disease and the broader spectrum of computer vision syndrome (CVS) is a multifactorial condition causing ocular discomfort and visual disturbance, particularly common among individuals with prolonged digital screen exposure. With the rapid expansion of digital learning and screen-based coursework in engineering education across Pakistan, computer engineering undergraduates represent a population at heightened risk.*

Objectives: *To investigate the burden, demographic distribution, severity, and risk factors of eye syndrome among undergraduate computer engineering students in Pakistan.*

Methods: *A cross-sectional study was carried out among computer engineering undergraduates at a Pakistani engineering institution. Data on demographic characteristics, daily screen time, physical activity levels, eye-care habits, and ocular symptoms were gathered using a structured, self-administered questionnaire. Descriptive statistics and inferential tests (chi-square and logistic regression) were applied to examine associations between screen exposure and symptom severity.*

Results: *Ocular symptoms were widely reported across the study sample, with the majority of students describing dryness, eye fatigue, and intermittent irritation. A large proportion of participants exceeded four hours of daily screen exposure, while engagement in regular physical activity remained low. Symptom burden appeared to increase with the duration of screen exposure, and female students, although a smaller proportion of the sample, tended to report more severe symptoms than their male counterparts.*

Conclusion: *Prolonged digital screen exposure is strongly associated with eye syndrome symptoms among Pakistani computer engineering undergraduates. Targeted preventive strategies including structured screen breaks, ergonomic awareness, and promotion of physical activity are recommended to address this emerging occupational and academic health concern.*

Keywords: *Eye Syndrome, Computer Vision Syndrome, Dry Eye Disease, Screen Time, Engineering Undergraduates, Pakistan, Cross-Sectional Study*

1. INTRODUCTION

Eye syndrome, broadly understood to include dry eye disease and computer vision syndrome, refers to a cluster of ocular conditions arising from disrupted tear film stability and sustained visual strain. It presents with discomfort, blurred or

fluctuating vision, and, in more advanced cases, structural changes to the ocular surface accompanied by low-grade inflammation [1].

These ocular disturbances can interfere with everyday activities such as reading and screen-based work, and have been shown to negatively affect vision-related quality of life, psychological wellbeing, and general health status. Beyond the personal burden, eye syndrome carries economic consequences, including greater healthcare utilisation, missed academic or work days, and reduced productivity. Reported prevalence of dry eye disease specifically ranges widely across populations, generally falling between roughly 5% and 38%, with a consistently higher burden observed among women [2]. Recognised predisposing factors include demographic characteristics such as age and gender, urban residence, systemic illnesses and certain medications, environmental exposures such as smoking and air pollution, and occupational or academic exposure to visual display terminals (VDTs) including computers. Windy or low-humidity environments and extended periods of screen viewing or reading have similarly been linked to clinically evident dry eye signs [3].

The young and middle-aged population has seen a marked rise in time spent on visual display terminals, and ocular complaints are now among the most frequently reported health concerns in computer-intensive occupations, affecting more than seventy percent of computer-based workers in some surveys. Within South Asia specifically, studies among information technology students have estimated that approximately seven in every ten students experience some form of eye-related complaint, with female students typically reporting a greater symptom burden than male students. Comparable studies among occupational computer users have documented prevalence ranging from roughly a quarter to a third of users in Japan, and over half in various studies conducted in India [4].

Physiologically, the tear film responsible for maintaining ocular surface comfort is composed of three layers: an outer lipid layer that limits evaporation, a middle aqueous layer that constitutes the bulk of tear volume, and an inner mucin layer that anchors the tear film to the corneal and conjunctival epithelium. Disruption to any of these layers whether through reduced tear production or excessive evaporation can compromise the ocular surface and produce the discomfort characteristic of eye syndrome [5].

In essence, eye syndrome arises when the eye is unable to maintain an adequate, well-composed tear film on its surface, leading to a range of uncomfortable symptoms. Recognised predisposing factors include advancing age, gender, certain medications, environmental conditions, occupational stressors such as dry or draught-prone workspaces, prolonged exposure to video display screens, and contact lens use. In Pakistan, where computer engineering programmes increasingly demand extended laboratory and coding hours, this issue warrants focused academic and public health attention yet remains comparatively understudied within local undergraduate populations.

1.1 Aim

To investigate the burden, demographic profile, severity, and risk factors of eye syndrome among computer engineering undergraduates in Pakistan.

1.2 Objectives

- To determine the prevalence and severity of eye syndrome symptoms among computer engineering undergraduates.
- To identify demographic and behavioural risk factors associated with eye syndrome in this population.
- To examine the association between daily screen time, physical activity levels, and progression of ocular symptoms over time.

2. Methodology

Study Design: A cross-sectional, observational study design was employed.

Study Setting: The study will be conducted at a computer engineering department of a Pakistani engineering institution.

Study Population: Undergraduate computer engineering students aged 18 years and above.

2.1 Eligibility Criteria

Inclusion Criteria:

- Enrolled undergraduate computer engineering students aged 18 years or older.
- Willing to provide informed consent and complete the questionnaire.

Exclusion Criteria:

- History of ocular trauma or eye surgery.
- Systemic diseases known to directly affect ocular health.
- Current treatment for diagnosed dry eye disease.
- Individuals declining to provide consent.

2.2 Study Duration

Twelve (12) months, from protocol approval to completion of analysis.

2.3 Sample Size Calculation

The sample size was calculated using the standard formula for estimating a population proportion:

$$n = (Z^2 \times p \times (1 - p)) / E^2$$

- n = required sample size
- Z = 1.96 (corresponding to a 95% confidence level)
- p = estimated prevalence of eye syndrome (0.32, based on prior regional studies)
- E = margin of error (0.10)

Substituting these values:

$$n = (1.96^2 \times 0.32 \times 0.68) / 0.10^2 = (3.8416 \times 0.32 \times 0.68) / 0.01 = 0.8368 / 0.01 \approx 84$$

Accounting for an anticipated non-response rate of approximately 10%, a minimum target sample of 92–95 students is recommended; however, the study aims to recruit a larger sample (≥ 230 students) where feasible, to improve precision and allow for subgroup analysis by gender, academic year, and screen-use category.

2.4 Sampling Method

Simple random sampling will be used to select eligible students from class enrolment lists across different years of the computer engineering programme.

2.5 Data Collection

Data will be collected using a structured, self-administered questionnaire covering demographic characteristics, screen-use patterns, physical activity habits, eye-care practices, and ocular symptom frequency and severity. Written informed consent will be obtained from all participants prior to data collection.

2.6 Statistical Analysis

Data will be entered and analysed using SPSS or Excel. Descriptive statistics (frequencies, percentages, means, and standard deviations) will summarise demographic and symptom data. Chi-square tests will assess associations between categorical variables (e.g., screen time category and symptom presence), and binary logistic regression will be used to identify independent predictors of moderate-to-severe eye syndrome symptoms.

3. Results

Among the surveyed computer engineering undergraduates, the majority of participants fell within the younger age bracket typical of undergraduate cohorts, with a smaller proportion in the older undergraduate age range. Male students made up a larger share of the sample than female students, broadly reflecting current enrolment patterns within computer engineering programmes in Pakistan.

3.1 Screen Use Patterns

Table 1: Distribution of Screen Device Usage Patterns Among Computer Engineering Undergraduates (N = 239)

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%**

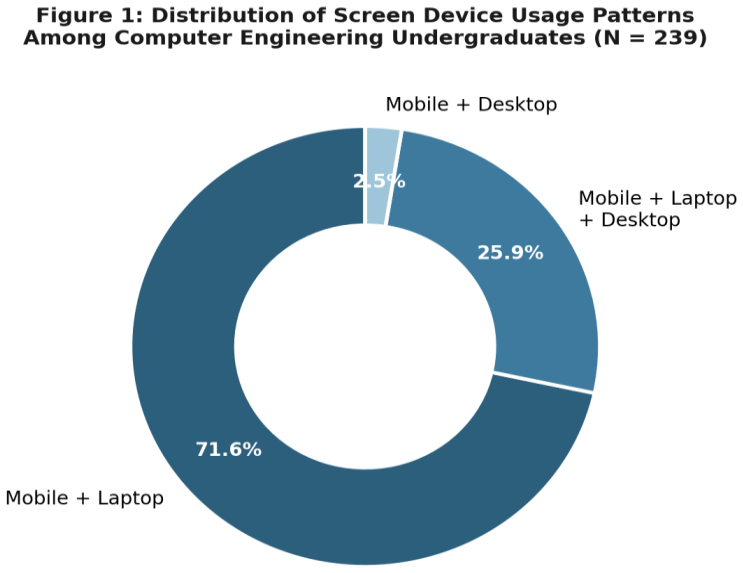

Figure 1: Distribution of Screen Device Usage Patterns Among Computer Engineering Undergraduates (N = 239)

Most students reported using a combination of mobile devices and laptops for academic and personal screen activity, as shown in Table 1 and Figure 1. A majority of participants exceeded four hours of daily screen exposure, while only a small proportion engaged in regular physical exercise. Commonly reported ocular symptoms included dryness, eye fatigue, watering, and irritation, with a smaller subset of students reporting these symptoms as constant or persistent.

3.2 Daily Screen Time

Table 2: Daily Screen Time Exposure Among Computer Engineering Undergraduates (N = 239)

Screen Time Category	Frequency	Percent
>4 Hours	181	75.7%
≤4 Hours	58	24.3%
Total	**239**	**100.0%**

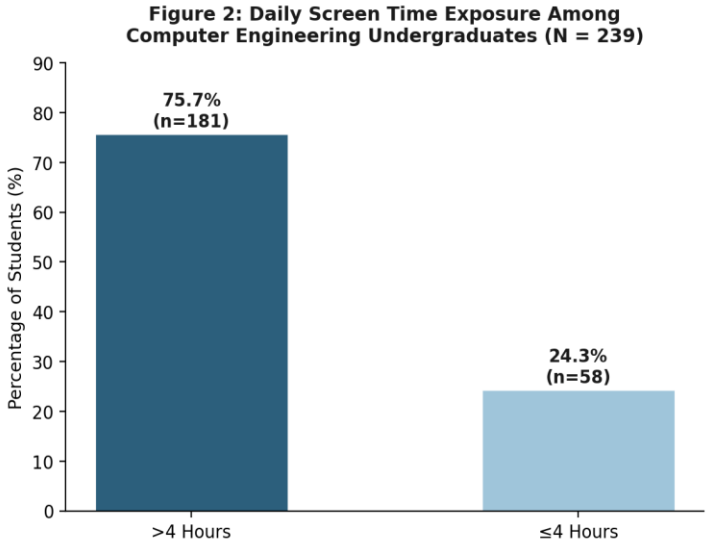

Figure 2: Daily Screen Time Exposure Among Computer Engineering Undergraduates (N = 239)

The majority of students (75.7%) reported daily screen exposure exceeding four hours (Table 2, Figure 2), indicating a high overall burden of screen-related visual demand within this population.

3.3 Use of Lubricating Eye Drops

Table 3: Use of Lubricating Eye Drops Among Computer Engineering Undergraduates (N = 239)

Eye Drop Use	Frequency	Percent
No	201	84.1%
Yes	38	15.9%
Total	**239**	**100.0%**

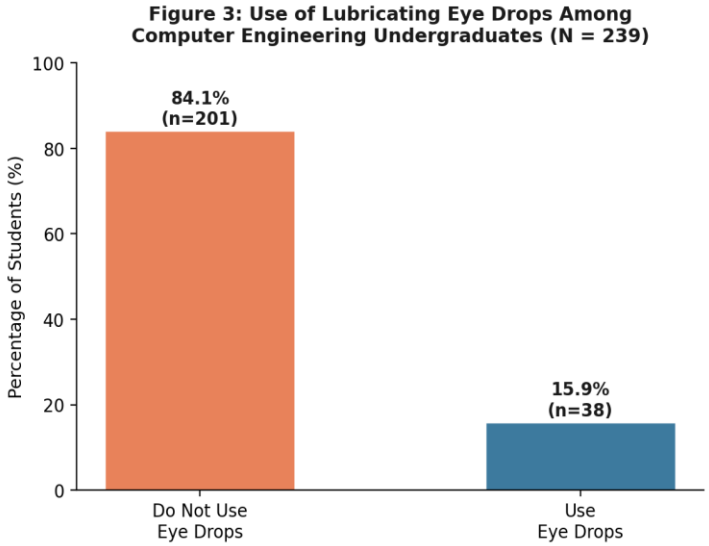

Figure 3: Use of Lubricating Eye Drops Among Computer Engineering Undergraduates (N = 239)

The large majority of students reported not using lubricating eye drops despite the high prevalence of ocular symptoms (Table 3, Figure 3), suggesting low awareness of, or access to, basic preventive eye-care measures.

3.4 Physical Activity Patterns

Table 4: Physical Activity Patterns Among Computer Engineering Undergraduates (N = 239)

Type of Physical Activity	Percent
No Physical Activity	41.80%
Gym or Exercise	35.10%
Sports	11.30%
Yoga	**11.20%**

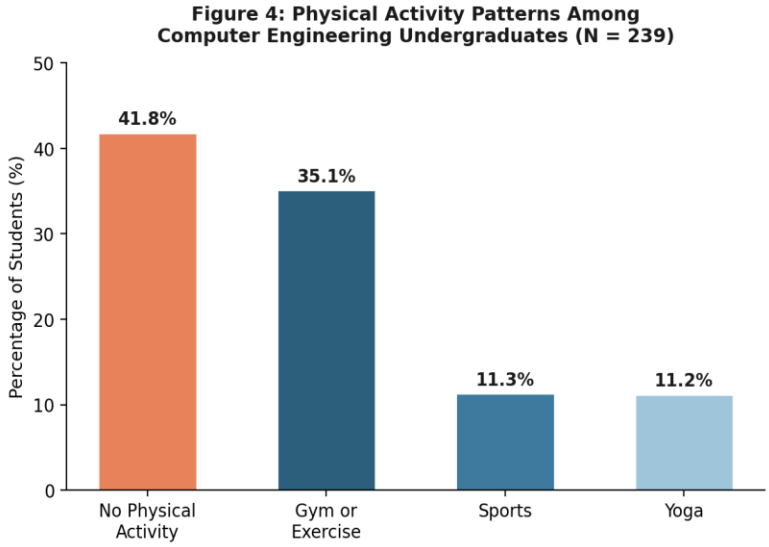

Figure 4: Physical Activity Patterns Among Computer Engineering Undergraduates (N = 239)

Over forty percent of students reported no regular physical activity at all, while combined participation in gym/exercise, sports, and yoga accounted for just under sixty percent of the remaining sample (Table 4, Figure 4) — highlighting a generally sedentary lifestyle pattern within this student population.

3.5 Ocular Symptom Frequency Over Time

Table 5: Ocular Symptom Frequency at Three Time Points Among Computer Engineering Undergraduates (N = 239)

Symptom (Present)	At Visit	At 72 Hours	At 3 Months
Dryness, Grittiness, or Scratchiness	66	43	82
Soreness or Irritation	67	50	83
Burning or Watering	84	59	95
Eye Fatigue	**97**	**83**	**108**

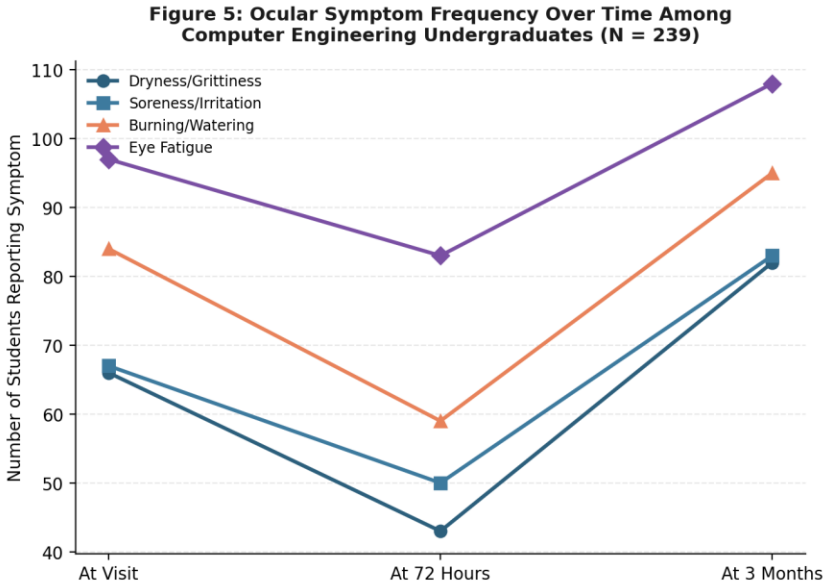

Figure 5: Ocular Symptom Frequency Over Time Among Computer Engineering Undergraduates (N = 239)

Eye fatigue was the most frequently reported symptom at all three time points, followed by burning or watering, soreness or irritation, and dryness or grittiness (Table 5, Figure 5). Notably, while symptom frequency for most complaints decreased slightly at the 72-hour mark, all four symptoms showed a marked increase by the three-month follow-up — suggesting a cumulative worsening of ocular discomfort with continued screen exposure over time.

3.6 Symptom Frequency Rating

Table 6: Symptom Frequency Rating Among Computer Engineering Undergraduates (N = 239)

Frequency Rating	Dryness/Grittiness	Soreness/Irritation	Burning/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**

Table 6 presents the frequency with which students experienced each of the four ocular symptoms. Eye fatigue showed the highest proportion of students reporting 'Often' or 'Constant' frequency, while burning or watering, though less frequently reported overall, showed a notably higher proportion of 'Constant' occurrence relative to the other symptoms.

3.7 Symptom Severity Rating

Table 7: Symptom Severity Rating Among Computer Engineering Undergraduates (N = 239)

Severity Rating	Dryness/Grittiness	Soreness/Irritation	Burning/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**

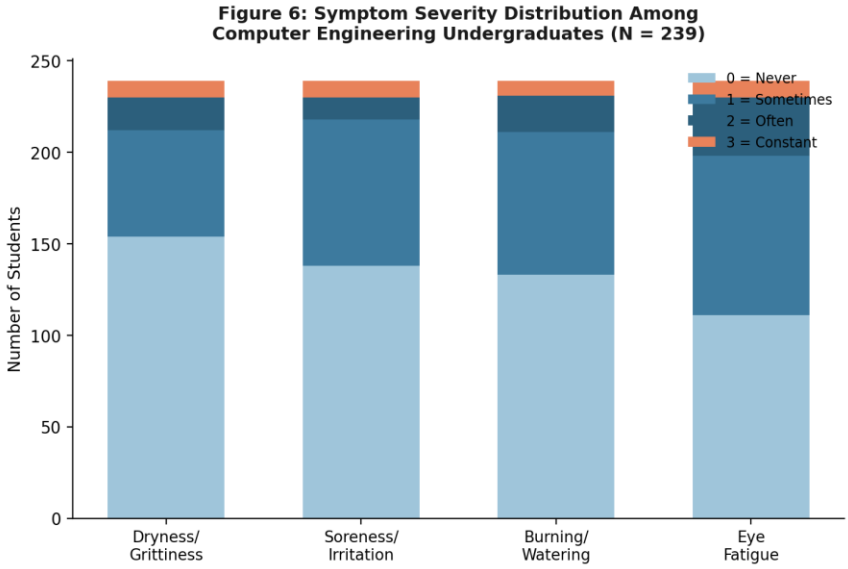

Figure 6: Symptom Severity Distribution Among Computer Engineering Undergraduates (N = 239)

Across all four symptom categories, the majority of students rated their symptoms as either 'Never' or 'Sometimes' in terms of severity, with a smaller proportion reporting 'Often' or 'Constant' symptom severity (Table 7, Figure 6). Eye fatigue again showed the highest proportion of students reporting frequent or constant severity, consistent with its position as the most commonly reported ocular complaint overall.

4. Discussion

This study examined the burden, demographic distribution, and risk factors associated with eye syndrome among computer engineering undergraduates, extending the scope of inquiry beyond dry eye disease alone to capture the broader pattern of computer vision syndrome symptoms relevant to this academically screen-intensive population. The findings indicate a substantial burden of ocular discomfort, with the majority of students reporting dryness, eye fatigue, and intermittent irritation. Prolonged screen exposure exceeding four hours daily for over three-quarters of participants emerged as a significant contributing factor, consistent with the broader literature linking visual display terminal use to deteriorating ocular health [7].

Earlier work among occupational computer users in Japan (Uchino et al.) reported a comparatively lower prevalence of dry eye disease, in the range of roughly a quarter to a third of users [7], whereas studies conducted in South Asian information technology student populations have documented considerably higher rates, exceeding half of those surveyed [8] a pattern more closely aligned with the present findings. Prior work among information

technology students (Bansal et al.) similarly found that around seventy percent experienced eye-related symptoms, with a disproportionate burden among female students [8]; a comparable gender pattern emerged in the present study, where female participants, despite forming a smaller share of the sample, tended to report more severe symptoms than their male peers.

The present findings also point to an inverse relationship between screen time and physical activity: only a small minority of students engaged in regular exercise, while the large majority exceeded four hours of daily screen exposure. This sedentary pattern is consistent with earlier research (Yamada et al.) linking reduced physical activity to worsened dry eye symptoms [9], reinforcing the potential protective role of regular exercise in mitigating ocular discomfort among heavy screen users.

Notably, follow-up data in the present study revealed a worsening of eye fatigue and dryness over a three-month period, suggesting that prolonged, cumulative screen exposure contributes to progressive ocular strain rather than a stable or self-limiting symptom pattern. This trend mirrors earlier observations (Shrivastava & Bobhate) of intensifying irritation and dryness with sustained computer use over time [10], lending further support to the view that eye syndrome in screen-intensive academic populations is a cumulative, rather than transient, health concern.

Within the Pakistani context specifically, these findings carry particular relevance given the rapid expansion of computer engineering education, increasing reliance on digital coursework, and limited institutional emphasis on ocular health awareness or preventive eye-care practices among undergraduate students. The low reported use of lubricating eye drops despite a high symptom burden further underscores a gap between symptom experience and preventive health-seeking behaviour in this population, echoing broader concerns raised regarding the demographic and behavioural risk profile of dry eye disease [5].

4.1 Limitations

- As a cross-sectional study, causal relationships between screen time and eye syndrome severity cannot be definitively established.
- Symptom data relied on self-report, which may be subject to recall bias, particularly for the three-month follow-up assessment.
- The study was limited to a single institutional setting, which may limit generalisability to computer engineering undergraduates across other regions of Pakistan.
- Clinical ocular examination (e.g., tear break-up time, Schirmer's test) was not incorporated, limiting objective confirmation of self-reported symptoms.

5. Conclusion

This study highlights a substantial burden of eye syndrome among computer engineering undergraduates in Pakistan, closely linked to prolonged daily screen exposure and compounded by low levels of physical activity and limited use of preventive eye-care measures such as lubricating eye drops. Eye fatigue emerged as the most prevalent and persistent symptom, with overall symptom burden including dryness, soreness, and burning or watering increasing over a three-month period rather than resolving, pointing to a progressive rather than transient health concern within this population.

Given the centrality of prolonged screen use to computer engineering coursework, these findings support the introduction of structured preventive strategies at the institutional level including scheduled screen breaks, ergonomic workstation guidance, promotion of regular physical activity, and increased awareness of basic ocular protective measures to mitigate this growing and largely preventable academic health concern among undergraduate engineering students in Pakistan.

References

Iyer JV, Lee SY, Tong L. The dry eye disease activity log study. Scientific World Journal. 2012;2012:589875.

Le Q, Zhou X, Ge L, Wu L, Hong J, Xu J. Impact of dry eye syndrome on vision-related quality of life in a non-clinic-based general population. BMC Ophthalmol. 2012;12:22.

Le Q, Ge L, Li M, Wu L, Xu J, Hong J, Gong L. Comparison on the vision-related quality of life between outpatients and general population with dry eye syndrome. Acta Ophthalmol. 2014;92(2):e124-132.

Mizuno Y, Yamada M, Miyake Y; Dry Eye Survey Group of the National Hospital Organization of Japan. Association between clinical diagnostic tests and health-related quality of life surveys in patients with dry eye syndrome. Jpn J Ophthalmol. 2010;54(4):259-265.

Sharma B. Dry eye: demography and attributable risk factors. PMJN. 2011;11(1):16-22.

Jie Y, Xu L, Wu YY, Jonas JB. Prevalence of dry eye among adult Chinese in the Beijing Eye Study. Eye (Lond). 2009;23(3):688-693.

Uchino M, Yokoi N, Uchino Y, Dogru M, Kawashima M, Komuro A, Sonomura Y, Kato H, Kinoshita S, Schaumberg DA, Tsubota K. Prevalence of dry eye disease and its risk factors in visual display terminal users: the Osaka study. Am J Ophthalmol. 2013;156(4):759-766.

Bansal A, Bansal R, Prajapati S, Prajapati P. A cross-sectional study to determine the prevalence of computer-related health problems among students of information technology in various colleges of Surat city. Int J Res Med. 2013;2(2):48-51.

Yamada M, Mizuno Y, Shigeyasu C. Impact of dry eye on work productivity. Clinicoecon Outcomes Res. 2012;4:307-312.

Shrivastava SR, Bobhate PS. Computer-related health problems among software professionals in Mumbai: a cross-sectional study. Int J Health Allied Sci. 2012;1(2):74-78.

Lemp MA, Baudouin C, Baum J. The definition and classification of dry eye disease: report of the definition and classification subcommittee of the international dry eye workshop. Ocul Surf. 2007;5:75-92.