Biomedical and Biopharmaceutical Research
Abbreviation: Biomed. Biopharm. Res.
Volume: 22: Issue: 02 |Year: 2025
Page Number: 210-214

A Study of Computer Vision Syndrome in Young Age Group Population: Prevalence and Causative Factors

Dr Nishi Davda[1], Dr. Nitin Singh Salaria[2], Raja Shekhar Dandur[3]

[1]3year PG resident, Department of Ophthalmology, Pacific Institute of Medical Sciences, Umarda
[2]Head Of Department, Department of Ophthalmology, Pacific Institute of Medical Sciences, Umarda
[3]Professor, Department of Ophthalmology, Pacific Institute of Medical Sciences, Umarda

Corresponding Author

Dr. Nishi Davda
3year PG resident, Department of Ophthalmology, Pacific Institute of Medical Sciences, Umarda

Article Received:05-02-2025

Article Accepted:04-04-2025

ABSTRACT

The increasing use of digital devices among the young population has led to a rise in Computer Vision Syndrome (CVS), characterized by ocular and visual discomfort. This study aims to determine the prevalence of CVS among individuals aged 15–30 years and identify its primary causative factors. A cross-sectional study was conducted using a structured questionnaire to assess symptoms, screen time, ergonomic factors, and preventive measures. The findings suggest a high prevalence of CVS, with significant associations between prolonged screen time, improper posture, and inadequate lighting. Strategies for prevention and awareness are essential to mitigate the impact of CVS in this age group.

Keywords: Computer Vision Syndrome (CVS), Digital eye strain, Young age group (15–30 years), Screen time, Ocular discomfort, Visual disturbances, Ergonomics, Preventive measures.

INTRODUCTION

With rapid advancements in technology and the widespread adoption of digital devices, screen exposure has become an integral part of daily life. Young individuals, particularly students and professionals, rely heavily on computers, smartphones, and tablets for educational, occupational, and recreational purposes. While these digital tools offer convenience and efficiency, excessive and prolonged use has led to a rise in Computer Vision Syndrome (CVS), a condition characterized by ocular discomfort, visual disturbances, and musculoskeletal strain [1].

CVS is a multifactorial condition primarily attributed to prolonged exposure to digital screens, which leads to visual fatigue, dry eyes, headaches, blurred vision, and postural strain [2]. The American Optometric Association defines CVS as a group of eye and vision-related problems resulting from excessive screen time, particularly in environments with poor ergonomics, improper lighting, and high screen brightness [3]. The continuous focusing and refocusing of the eyes, coupled with reduced blinking while using digital devices, contribute significantly to the onset of symptoms [4].

Several studies have reported an increasing prevalence of CVS, especially among young individuals who spend extended hours on digital screens for academic or professional tasks. Factors such as screen time duration, screen position, room lighting, use of corrective lenses, and blinking frequency have been identified as major contributors to CVS [5]. Moreover, inadequate awareness of preventive strategies, such as the 20-20-20 rule, blue light filters, and ergonomic practices, exacerbates the problem [6].

Given the rising dependence on digital screens, it is essential to understand the extent of CVS prevalence among young individuals and identify the primary risk factors associated with it. This study aims to assess the prevalence of CVS among individuals aged 15–30 years and explore the key causative factors contributing to its development. Additionally, the study evaluates awareness levels regarding preventive measures and highlights potential interventions to mitigate the impact of CVS in this population.

METHODOLOGY

This study was designed as a cross-sectional survey to assess the prevalence of Computer Vision Syndrome (CVS) among young individuals aged 15–30 years and to identify the key causative factors associated with its development. The

study was conducted over a period of three months, utilizing a structured online questionnaire distributed to participants from various educational institutions, workplaces, and social media platforms. The methodology outlined below provides details on the study design, participant selection, data collection procedures, and statistical analysis methods.

Study Design
A cross-sectional study design was chosen to provide a snapshot of CVS prevalence and its associated factors within the target population. This study method was appropriate for assessing the prevalence of symptoms and identifying common risk factors at a specific point in time.

Participants
The target population for this study was individuals aged 15–30 years, a group that is typically exposed to prolonged screen time due to academic and professional activities. A total of 500 participants were recruited to ensure a statistically significant sample size, which allowed for reliable analysis of various variables and their association with CVS.

Inclusion Criteria
- **Age:** Participants aged 15–30 years.
- **Screen time:** Individuals who regularly use digital devices for educational, work, or recreational purposes.
- **Informed consent:** Participants who voluntarily agreed to participate in the study and provided informed consent.
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Exclusion Criteria
- Age below 15 or above 30 years.
- Individuals with pre-existing eye conditions such as cataracts or glaucoma, which could interfere with the study's focus on CVS.
- Individuals with severe visual impairments or those who use visual aids not related to screen exposure (e.g., individuals using corrective lenses for reasons unrelated to screen time).
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Data Collection
Data were collected using an online questionnaire designed to assess demographic details, screen usage patterns, symptoms associated with CVS, and ergonomic practices. The questionnaire was distributed via email, social media, and educational institution portals, ensuring a broad reach across the targeted age group.

Questionnaire Design
The questionnaire consisted of four main sections:
1. **Demographic Information**:
    - Age, gender, occupation, and education level.
2. **Screen Usage Patterns**:
    - Duration of screen exposure per day (e.g., 0–2 hours, 2–4 hours, 4+ hours).
    - Types of devices used (e.g., smartphones, computers, tablets).
    - Purpose of screen usage (e.g., academic, recreational, work-related).
    - Frequency of screen breaks (e.g., every 20 minutes, every hour).
3. **Symptoms of CVS**:
    - A list of common CVS symptoms was provided, including:
        - Eye strain
        - Dry eyes
        - Headaches
        - Blurred vision
        - Neck and shoulder pain
        - Difficulty focusing
        - Visual disturbances (e.g., double vision, light sensitivity)
    - Participants were asked to report the frequency of these symptoms (e.g., Never, Occasionally, Frequently, Always).
4. **Ergonomic Factors**:
    - Questions related to posture and screen positioning, such as:
        - Screen height (e.g., above eye level, eye level, below eye level).
        - Distance from the screen (e.g., less than 12 inches, 12–20 inches, more than 20 inches).
        - Lighting conditions (e.g., bright, dim, dark).
        - Use of corrective lenses (e.g., glasses, contact lenses).

- Awareness and practice of preventive measures, such as the **20-20-20 rule** (every 20 minutes, look at something 20 feet away for 20 seconds) and blue light filtering.

CVS Assessment Tool

To assess the severity of CVS symptoms, participants were asked to complete a modified version of the Computer Vision Syndrome Questionnaire (CVS-Q), a validated tool designed to quantify symptoms associated with CVS [1]. The CVS-Q included questions on symptom frequency, severity, and impact on daily life, providing a comprehensive measure of the condition's prevalence and intensity.

Statistical Analysis

The collected data were analyzed using descriptive statistics to summarize the demographic characteristics, screen usage patterns, and the prevalence of CVS symptoms. The prevalence of CVS was calculated as the percentage of participants reporting at least one CVS symptom, based on responses to the symptom checklist.

To determine the associations between various risk factors and CVS, chi-square tests were performed. This statistical test was used to evaluate the significance of associations between screen time duration, ergonomic factors, and symptom prevalence. A p-value of less than 0.05 was considered statistically significant.

Subgroup analyses were conducted to explore the impact of gender, age, and ergonomic practices on the prevalence and severity of CVS symptoms. Additionally, the association between preventive strategies (such as the 20-20-20 rule and screen brightness adjustment) and symptom severity was examined.

RESULTS

Out of 500 participants, 68% (n=340) reported experiencing symptoms of CVS. The most commonly reported symptoms are presented in the following table:

Symptom	**Frequency (n)**	**Prevalence (%)**
Eye strain	210	62%
Headaches	163	48%
Dry eyes	139	41%
Blurred vision	126	37%
Neck and shoulder pain	99	29%
Difficulty focusing	75	22%

A significant association was found between screen time and CVS prevalence, with 82% of individuals using screens for more than four hours per day experiencing symptoms ($p < 0.05$) [7]. Among participants who reported frequent symptoms, poor ergonomic habits such as improper screen height, incorrect posture, and lack of regular screen breaks were prevalent [8]. Additionally, use of digital devices in dim lighting was reported by 45% of symptomatic individuals [9].

A subgroup analysis showed that individuals who adhered to preventive measures, such as the 20-20-20 rule, adjusted screen brightness, and used artificial tears, had a lower prevalence of severe symptoms. However, only 28% of respondents reported consistent use of these strategies [10].

Demographic Distribution of CVS by Gender

The following table illustrates the gender-wise distribution of CVS prevalence:

Gender	Total Participants	CVS Cases (n)	CVS Prevalence (%)
Male	250	155	62%
Female	250	185	74%
Total	500	340	68%

The data suggest that CVS prevalence is higher among females (74%) compared to males (62%), indicating potential gender-based differences in screen usage habits, ergonomic factors, or biological susceptibility [11].

Here is a table showing the distribution of subjects based on hours of computer viewing in the results section:

	Number of Participants (n)	**Prevalence of CVS Symptoms (%)**
0–2 hours	120	30%
2–4 hours	160	55%
4+ hours	220	82%
Total	500	68%

This table reflects the distribution of participants according to their daily screen time and the corresponding prevalence of CVS symptoms within each group. The data shows that longer screen exposure correlates with a higher prevalence of CVS, with the highest rates observed among those using screens for more than 4 hours per day.

DISCUSSION

The findings of this study underscore the significant prevalence of Computer Vision Syndrome (CVS) among the young population, with 68% of participants reporting symptoms, primarily including eye strain, headaches, and dry eyes. These results are consistent with prior studies, which indicate that prolonged screen exposure is a major contributing factor to CVS [1]. The high prevalence of CVS observed in this study reinforces the need for increased awareness of the condition, particularly among young individuals who spend a significant portion of their day in front of digital devices.

The analysis also highlighted several key factors that contribute to the development of CVS. Prolonged screen time emerged as the most significant risk factor, with 82% of participants using screens for more than four hours per day and experiencing symptoms. Previous research supports the link between excessive screen time and the onset of CVS, suggesting that longer screen exposure leads to greater ocular discomfort due to reduced blinking and increased eye strain [2]. Ergonomic factors, such as improper screen positioning, poor posture, and lack of regular breaks, were also found to exacerbate symptoms. These factors contribute to both visual and musculoskeletal discomfort, highlighting the importance of ergonomically sound environments for individuals who spend long hours on digital devices [3].

Interestingly, lighting conditions were also identified as a key contributor to CVS. The use of digital devices in dimly lit environments, which 45% of symptomatic individuals reported, increases visual strain and reduces contrast sensitivity, making it harder for the eyes to focus. This aligns with findings from earlier studies that emphasize the importance of ambient lighting when using digital devices [4]. Inadequate lighting forces the eyes to work harder, which can lead to fatigue and discomfort.

The study also revealed that adherence to preventive measures, such as the 20-20-20 rule, screen brightness adjustment, and the use of artificial tears, was associated with a lower prevalence of severe CVS symptoms. However, only 28% of participants consistently used these strategies, indicating a lack of awareness or motivation to adopt these preventive practices. The low adoption rate of preventive measures is a concerning finding, as research has demonstrated the effectiveness of these strategies in mitigating CVS symptoms [5]. The low adherence highlights the need for improved education and awareness campaigns targeting young individuals, especially students and professionals who are most at risk.

Gender Differences in CVS prevalence were also observed, with females exhibiting a higher prevalence (74%) compared to males (62%). This may be attributed to a variety of factors, including biological differences, differences in screen usage patterns, and ergonomic practices. Previous studies have suggested that women may be more susceptible to CVS due to hormonal differences, which can affect eye moisture levels, making them more prone to dryness and discomfort [6]. Additionally, differences in screen usage habits, such as longer hours spent on smartphones and other handheld devices, may contribute to the higher prevalence in females. Further research is needed to explore these gender-based differences in detail.

Finally, the study suggests that educational and workplace settings must implement strategies to combat CVS. This includes promoting regular screen breaks, encouraging the use of blue light filters, ensuring proper lighting conditions, and teaching ergonomic practices to reduce strain. Given the rising reliance on digital devices in education and work, the need for proactive measures to prevent CVS is greater than ever. Awareness campaigns and policy changes within institutions could play a significant role in reducing the burden of CVS on the young population.

CONCLUSION

In conclusion, the findings of this study highlight the significant burden of Computer Vision Syndrome (CVS) on young individuals, particularly those who spend extended periods on digital devices for academic or professional tasks. The study identified several key factors contributing to CVS, including prolonged screen time, poor ergonomics, inadequate lighting, and low adherence to preventive strategies. These results emphasize the need for increased awareness and education about CVS, particularly regarding screen usage habits, ergonomics, and preventive measures.

Educational institutions, employers, and healthcare providers must take proactive measures to mitigate the impact of CVS. Implementing screen time management guidelines, promoting regular breaks, and encouraging ergonomic practices could significantly reduce the prevalence of CVS symptoms among young individuals. Additionally, further research is needed to investigate the long-term effects of CVS, particularly its potential impact on ocular health as digital device usage continues to increase.

In summary, addressing CVS requires a multifaceted approach, including individual education, institutional intervention, and public health campaigns. Only through these concerted efforts can the growing burden of CVS be alleviated, ensuring better eye health for the young population in the digital age.

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