

**The prevalence and risk factors associated with computer vision syndrome among computer terminal users in Ahmedabad.**

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**Abstract:**

**Background:** Corporate world has witnessed significant rise in computer usage to keep up with fast paced improvement in technology, dynamic data requirement and real-life experiences. Extensive usage of these computers results in stress to one of the most vital organs of body eyes. The complex phenomenon of such stress is coined as Computer vision syndrome (CVS). The shift of industrialization resulted in significant rise in computer display terminals and eventually CVS.

**Aim:** The study was undertaken to estimate the prevalence and risk factors associated with Computer vision syndrome among computer terminal users.

**Methodology:** 320 computer terminal users from various IT parks and corporate offices in the Ahmedabad, India was interviewed. A preformed, pretested and semi-structured questionnaire was used to obtain data pertaining to the work pattern, computer usage and eye strain. Data was analyzed using MS office Excel and Epi Info.

**Results:** The results revealed that 80.9% of the respondents suffered from at-least one visual complaints of CVS at their workplace. The study reported eye strain

(75%) and dry eye (77.5%) as most common complaints followed by itching (58.4%), headache (18.8%), and blurred vision (10%).

**Conclusion:** Prolonged computer and mobile usage; inadequate rest during task; improper arrangement of computer terminal, improper light and glare and non-receipt of ergonomic training were the risk factors of CVS. High prevalence of visual complaints highlights the knowledge gap among employees for CVS.

**Keywords:** Computer vision syndrome, Computer terminal user, Ergonomics.

**Introduction**

Potential health hazards of computers were not even in the hindsight at the time when IBM introduced first ever personal computer for world.<sup>[1]</sup> Now a days a personal computer is one of the most common office tools used across the globe. It has become the absolute necessity of 21st century. The use of computers in all institutions, teaching facilities, universities, corporates, NGOs and homes has made life easier and optimized the output tremendously. <sup>[2,3]</sup> However, their constant usage has led to a health risk of developing computer vision syndrome (CVS), backache, tension headaches and psychosocial

stress.<sup>[4]</sup> Ocular complaints of computer users have been clubbed together and coined as CVS.<sup>[5]</sup>

The American Optometric Association defines CVS as a complex of eye and visual complaints related to the activities that stress the near vision and that are experienced in relation to, or during, the use of the computer. It is characterized by visual symptoms that result from interaction with computer display or its environment.<sup>[6]</sup> CVS is a comprehensive term that covers various eye and environment-related factors that occur when the visual demands exceed the visual capabilities, leading to inability to focus properly. For optimal image creation on retina the eyes need to focus again and again for extended period of time while viewing the screen.<sup>[7]</sup> CVS can be presented in form of eye strain, irritation, redness, fatigue, headaches, burning sensation, glare sensitivity, double vision and periodic blurring of vision.<sup>[8]</sup>

Factors leading to CVS are generally categorized as personal factors – poor sitting position, improper viewing distances, improper viewing angle, ocular diseases, medical diseases and aging and environment; and computer factors – poor lighting, poor resolution, poor contrast, glare of the display and slow refresh rate.<sup>[9]</sup>

Today, a condition known as computer vision syndrome (CVS) is common to millions of computer users. In the USA more than 143 million Americans work on a computer each day with an estimated 90% suffering from computer eyestrain. CVS remains an underestimated and poorly understood condition at the workplace.<sup>[10]</sup>

Ahmedabad, a mega city of western India has witnessed significant rise in IT parks and corporate offices. Employees of these corporates also face similar challenges. However, there was no study reported in the city to highlight the prevalence and risk factors of CVS. Therefore, this study was conducted with the following

objectives: To estimate the prevalence of computer vision syndrome and to identify associated risk factors among computer terminal users of various corporate offices.

### **Material & Methods**

**Study Design:** This is a cross-sectional prevalence study conducted to study the eye health and impact of extensive computer usage on eyes in form of CVS. The study was carried out in IT parks and corporate offices situated in city of western India; Ahmedabad.

**Sample size & Study participants:** With 69.3% prevalence,<sup>[11]</sup> 95% confidence and absolute error of 5% the calculated sample size in this study was 320 individuals fulfilling the inclusion criteria. Only office employees working on desk with experience of more than one year were enrolled in the study.

**Data Collection tool:** A preformed, pre-tested and semi-structured questionnaire was used to obtain data. A questionnaire involves areas like the socio-demographic data, work pattern, design of computer terminal, environmental factors. It also covers areas of eye health and various presentation of CVS such as eye strain, blurring, itching, headache and dry eye. An insight and impact about the research was communicated to them beforehand and informed consent was obtained from all of the respondents before starting the data collection process.

**Data Analysis:** Statistical analysis was performed using standard descriptive statistical tests with the help of MS Office Excel and Epi Info. Frequency distribution and percentages were computed for the tables. To test the null hypothesis; statistical test of significance like Chi-square was used.  $P < 0.05$  was used to define the statistically significant association.

### **Results**

The present study enrolled 320 computer terminal users. The study participant includes 240 (75%) male and 80

(25%) female workers. The age of worker varies from 21 years to 58 years. The total work experience varies from 1 year to 37 years. The mean age of the study subjects was 34 years whereas mean job experience of participants was 8 years. Looking in to relationship status of workers; 248 (77.5%) were married while 60 (18.8%) were unmarried. 12 (3.7%) of the study participants were separated or divorced.

Table 1: Socio-demographic profile of study participants

Variable	Frequency (N)	Percentage (%)
Sex		
Male	240	75
Female	75	25
Age (In Years)		
21 – 30	95	29.6
31 – 40	119	37.3
41 – 50	81	25.3
51 – 60	25	7.8
Experience (In Years)		
< 10	186	58.1
> 10	134	41.9
Marital status		
Married	248	77.5
Unmarried	60	18.8
Separated/ Divorced	12	3.7
Total	320	100

Table 2: Computer vision syndrome and associated symptoms

Variable	Frequency (N)	Percentage (%)
Prevalence of CVS	259	80.9
Dry eye	248	77.5
Eye strain	240	75
Itching in eye	181	58.4
Blurred vision	32	10
Headache	60	18.8

Table 2 describes the prevalence of computer vision syndrome and various eye related complaints among computer terminal users. In our study; 259 subjects were suffering from at least one symptoms of CVS which reported prevalence of 80.9%. Almost three fourth of the participants complained eye strain (75%) and dry eye (77.5%). More than half (58.4%) of the computer users were suffering itching in eyes. Other complaints were blurred vision (10%) and headache (18.8%).

We evaluated personal and environmental risk factor impact assessment with CVS. To derive the association; Chi square test was used.  $P < 0.05$  was used as a level of significance. Personal factors affecting eyes like; more than 6 hours of combined computer and mobile usage in a day and not taking regular break from terminal usage at every half an hour were found out to be having statistically significant association ( $p < 0.001$ ). Environmental factors were also evaluated for association with CVS. Improper arrangement of computer terminal in terms of angle, height and distance is a risk factor for CVS with statistically significant association ( $p = 0.02$ ). Same is true for improper light and glare ( $p = 0.01$ ). In our study; Ergonomic training for proper usage of computer terminal has also been reported as an effective preventive measure against CVS ( $p < 0.001$ ).

Table 3: Risk factors of computer vision syndrome

Variable	CVS		X <sup>2</sup>	P-value
	Present (N=259)	Absent (N=61)		
>6 hours of computer + mobile usage	121	13	13	< 0.001
Improper arrangement of terminal	82	11	4.4	0.02

No regular break at half an hour	185	23	24.6	< 0.001
Improper light and glare	170	30	5.7	0.01
Non-receipt of ergonomic training	229	38	24.3	< 0.001

**Discussion**

In present study, we tried to evaluate the risk factors of computer vision syndrome among 320 computer terminal users. In our study; the estimated prevalence of CVS was 80.9%. Comparable to our study; 73% prevalence of CVS was reported by Aseefa et al. [12] in a study done among bank employees based at Ethiopia. Similar to our study Karnataka based study [11] reported prevalence of 70.3%. A study done among Information Technology students reported prevalence of 55.4%. Such high prevalence of CVS affected employees indicates underlying problem with personal and environmental risk factors.

CVS is an umbrella term which describes range of vision related symptoms. A funded study by Nepal health research council [13] reported various complaints like tired eye (63.3%), dry eyes (57.8%), headache (56.9%), itching in eyes (44%) and blurred vision (40.4%) among employees based at offices of Kathmandu metropolitan city. In a study done in Kolar district, Karnataka; [11] the most common symptom was eyestrain and fatigue (61.8%), followed by headache (55.1%), dryness of eyes (39.9%) & blurred vision (36.9%). Blurred vision (42.4%), headache (23.0%) and redness of eyes (23.0%) were the most experienced symptoms in a study done among 304 bank employees of Gondar city. [12] In line with mentioned studies; our study reported eye strain (75%) and dry eye (77.5%) as most common complaints followed by itching (58.4%), headache (18.8%), and

blurred vision (10%). Such high prevalence of visual complaints highlights the knowledge gap among employees for CVS.

In present study; prolonged computer and mobile usage; inadequate break in-between; improper arrangement of computer terminal, improper light and glare and non-receipt of ergonomic training were reported as statistically significant risk factors of CVS (p<0.05). According to; Assefa et al. [12] sitting position (Odds ratio=2.56), viewing distance (OR=2.05), the time taking break while using computer (OR=2.05) and using eye glasses (OR=3.17) were significantly associated with CVS. Soman Mani et al. [14] highlighted total usage of computer in a day, periodic break and hours spent at stretch on terminal were statistically significant risk factors for CVS (p<0.05). Similar to our study; a study done at Nepal; [13] reported total computer use/day>8 hours (OR=2.6), improper viewing distance (OR=3.2), not using an anti-glare screen (OR=2.6), not using eye-drops, and not wearing protective goggles (OR=3.1) were significantly associated with the presence of CVS. Such wide range of association indicates that a huge number of factors play a part in causing CVS.

**Conclusion**

The study revealed that there is a wide knowledge gap among corporate office employees about computer vision syndrome resulting in high prevalence of the same. Prolonged computer and mobile usage; inadequate rest during task; improper arrangement of computer terminal, improper light and glare and non-receipt of ergonomic training were the risk factors causing CVS.

**Recommendations**

Personal and environmental factors play a major part in causation of CVS. The standard ergonomics guidelines for establishing computer display terminals should be laid down by the organization. Employers should arrange

a training for their workers to address personal factors and knowledge gap of CVS.

### **Limitations**

The use of a self-report questionnaire may lead to response bias.

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