Prevalence and Associated Risk Factors of Computer Vision Syndrome among the Computer Science Students of an Engineering College of Bengaluru- A Cross-Sectional Study

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ABSTRACT

Background: In the present era, advancement in technology has led to prolong and rampant computer usage, due to which there has been a rapid upsurge in Computer related health problems. Computer Vision Syndrome (CVS) is a complex of eye and vision problems related to near work, experienced during or related to computer use. The present study was conducted with the objective of assessing the prevalence and associated risk factors of Computer Vision Syndrome among the Computer Science students of an Engineering College.

Methodology: A Cross sectional study was conducted among 150 Computer Science students of ACS College of Engineering, Bengaluru, for the duration of two months. Data was collected using a Pre tested, Semi structured self-administered questionnaire and analyzed by using SPSS (Statistical Package for Social sciences) version 21.0 Descriptive statistics was used.

Results: Out of 150 study subjects, majority i.e. 84(56%) were female, 38.7% were 20 years of age. The Prevalence of Computer Vision Syndrome was 86.67%. The commonest symptoms of Computer vision syndrome were Headache (83.5%) followed by Eye strain (64.6%). The association between Computer Vision Syndrome and sitting arrangements (chair support to lower back, keeping computer screen at eye level, monitor can be tilted/raised/lowered and screen having glare filter) was found to be statistically significant. Also the association between Computer Vision Syndrome and hours per day of working on computer was found to be statistically significant.

Conclusion: Computer Vision Syndrome was found to be very frequent among the Computer Science students, which emphasizes the need to adopt some preventive measures to avoid the condition.

Key words: Computer Vision Syndrome (CVS), Engineering College, Computer Science students, Risk factors.

INTRODUCTION

In the tech-driven 21st Century, use of Computer devices and gadgets has almost become indispensible in every aspect of life. It has been documented that 75% of all daily activities involve the use of Computer. [1] No doubt the use of Computer in all the institutions, colleges, universities, offices and homes has made life easier and also increased the work output tremendously, but at the same time it has also produced many dangers for human health along with deterioration of the quality of life of the Computer worker. [2] The use of Computers even for 3 hours per day, has led to a health risk of developing Computer Vision Syndrome, low back pain, tension headaches and psychological stress. [3]

The American Optometric Association defines Computer Vision Syndrome as "the complex of eye and vision problems related to the activities that stress the near vision and that are experienced in relation to or during the use of Computer". [4,5] Symptoms of Computer Vision Syndrome are broadly classified into four categories: i) Asthenopic- sore eyes, eye strain, (ii) Ocular surface related- dry eye, irritation, watering, (iii) Visual - double vision, blurred vision, slowness of focus

change iv) Extra ocular - shoulder pain, neck pain, back ache. The eye symptoms may be aggravated by poor lighting, glare, improper work station set up and uncorrected refractive errors. [6,7]

Globally, nearly60 million people are suffering from Computer Vision Syndrome and approximately a million new cases occur every year. [8,9] The Computer using population in India is more than 40 million and 80% of them have discomfort due to CVS. [10,11] American Optometric Association reports that approximately 14% of patients schedule eye examination because of CVS and such effected individuals are not aware that they have the condition. [12]

Very little research has been performed to document the effect of computer use on the physical health of Indian users especially among college students. [4] The present study was undertaken to assess the prevalence and associated factors of CVS among Computer Science students of an Engineering college of Bengaluru. Since CVS is a growing health issue which is significantly reducing the quality of life and productivity at work place, the present study will help the public health professionals and the stake-holders to plan and take measures to reduce it. It will also help to create awareness regarding risk factors of Computers and digital electronic devices. [7]

OBJECTIVE
1. To estimate the prevalence of Computer Vision Syndrome among Computer Science students of an Engineering college of Bengaluru.
2. To determine the risk factors associated with Computer Vision Syndrome among the study population.

MATERIALS & METHODS
Study setting: ACS College of Engineering, Bengaluru.
Study population: Computer Science Students.
Study design: Cross Sectional Study.

Study duration: Two months (October 2016 to November 2016)
Study tools: Pretested, Semi-structured Questionnaire.

Sample size: n = $\dfrac{4pq}{L^2}$

p= Prevalence= 81.9% (According to study conducted in Chennai by Logaraj M, Madhupriya V, Hegde SK, 2014)
q = 1-p = 18.1%, L = Allowable error = 8%

n = $\dfrac{4x81.9x18.1}{(6.55)^2}$

n = 138.21 (Rounded upto 150)

Inclusion Criteria: All those students who used computers in one month preceding the date of the study.
Exclusion Criteria: Students who were not willing to participate, absent at the day of data collection and suffering from previous eye problems even before starting use of computers.
Ethical considerations: Ethical approval was obtained from the Ethics Review Committee prior to start of study (Raja Rajeswari Medical College and Hospital, Bengaluru). Informed written consent was obtained from each study participant before administering the questionnaire.
Data Collection: Pre tested, Semi structured, self-administered questionnaire was used to collect the information. Study variables include socio-demographic profile, questions on duration of computer use, diagnostic criteria of CVS and posture styles is assessed by using diagrams. The study participants were instructed to mark any eye and other related symptoms experienced during computer use.
Diagnostic criteria of Computer Vision Syndrome: Students experiencing atleast one of the CVS related symptoms like redness of eyes, burning sensation of eyes, eye strain, blurred vision, dry eye, headache, backache and neck or shoulder pain. [6]
Data Analysis: The data was collected and compiled in MS Excel sheet and analyzed by using SPSS version 21.0.Descriptive statistics was used. Chi square test was

applied to know the association between two variables.

RESULTS

**Table 1: Sociodemographic Profile of Study Subjects(n=150)**

Sociodemographic Profile		Frequency(%)
Gender	Male	66(44.0)
	Female	84(56.0)
Age in Completed Years	19	45(30.0)
	20	58(38.7)
	21	36(24.0)
	22	11(07.3)
Religion	Hindu	134(89.3)
	Muslim	11(07.3)
	Christian	05(03.4)

With respect to the socio-demographic factors, majority i.e. 84(56%) were females, 58(38.7%) were 20 years of age and 134(89.3%) were Hindu by religion. The Mean age of the study participants was 20.08 ± 1.8 years. (Table 1)
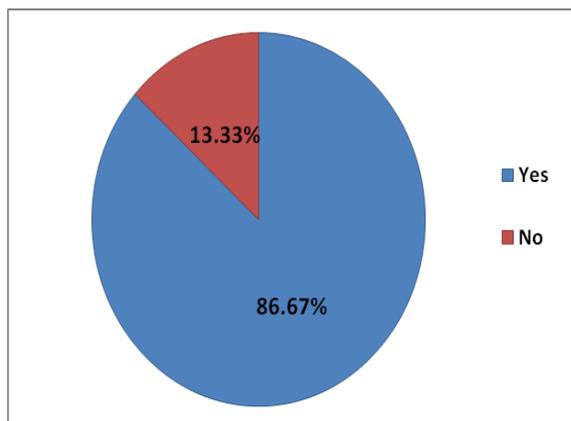
Figure1: Pie chart showing the study subjects with Computer Vision Syndrome (n=150)

The prevalence of Computer Vision Syndrome in the study subjects was 86.67% (Figure 1).
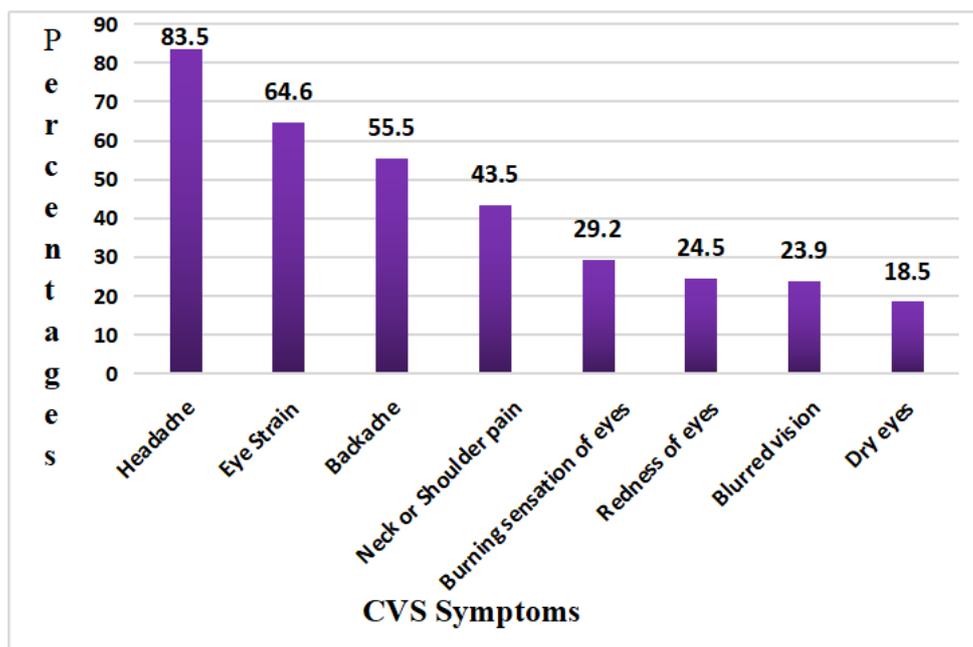
*Multiple responses

Figure 2: Bar diagram showing the symptoms of Computer Vision Syndrome in study subjects(n=130)*

Among 130 students having CVS, the most common symptoms were headache (83.5%), eye strain (64.6%) and backache (55.5%) (Figure 2)

Table 2: Distribution of study subjects according to their body postures(n=150)

Type of Postures	Correct Posture(%)	Incorrect Posture(%)
Head posture	150(100)	---
Head and Neck posture	53(35.3)	97(64.7)
Back posture	62(41.3)	88(58.7)

Majority of study subjects, had incorrect head and neck posture (64.7%) followed by the back posture (58.7%)

Table 3: Table showing sitting arrangements of study subjects during computer use(n=150)

Sitting arrangements a		Computer Vision Syndrome		Total	Chi Square Value	p value
		Yes (%)	No (%)			
Glare or reflection from other light source on monitor	Yes	25(78.12)	07(21.88)	32	2.57	0.10
	No	105(88.98)	13(11.02)	118		
Lean forward to clearly see the character on the computer screen	Yes	23(74.19)	08(25.81)	31	5.26	<0.05
	No	107(89.91)	12(10.09)	119		
Chair support your lower back	Yes	20(60.60)	13(39.40)	33	24.86	<0.001
	No	110(94.00)	07(06.00)	117		
Computer screen at eye level	Yes	46(74.19)	16(25.81)	62	14.23	<0.001
	No	84(95.45)	04(04.55)	88		
Monitor can be tilted/raised/lowered	Yes	36(70.59)	15(29.41)	61	17.29	<0.001
	No	94(94.95)	05(05.05)	99		
Screen having a glare filter	Yes	41(77.36)	12(22.64)	53	6.14	<0.001
	No	89(91.75)	08(08.25)	97		

Highly significant association was found between Computer Vision Syndrome and the following sitting arrangements i.e. chair support to lower back, keeping Computer screen at eye level, monitor can be tilted/raised/lowered and screen having a glare filter.

Table 4: Table showing the association between gender and Computer Vision Syndrome(n=150)

Gender	Computer Vision syndrome		Total (%)
	Yes(%)	No(%)	
Male	54(41.5)	12(60)	66 (44)
Female	76(58.5)	08(40)	84 (56)
Total	130(100)	20(100)	150(100)

Chi square= 2.40df= 1   p=0.12

Computer Vision Syndrome was more common in Females (58.5 %) as compared to Males (41.5 %). No significant association was found between gender and Computer Vision Syndrome.(Table 4).

Table 5: Table showing the association between hours per day working on computer and Computer Vision Syndrome(n=150)

Hours per day working on computer	Computer Vision Syndrome		Total(%)
	Yes(%)	No (%)	
<4 hrs	07(5.4)	13(65.0)	20(13.3)
4-6 hrs	83(63.9)	04(20)	87(58)
>6 hrs	40(30.7)	03(15)	43(28.7)
Total	130(100)	20(100)	150(100)

Chi-square=53.45df=2p<0.001

Computer Vision Syndrome was more frequent among students (63.9%) working on Computer for 4-6 hrs per day. Prevalence of CVS among students who used Computers for ≥4hrs per day was 94.6%.

Highly significant association (p <0.001) was found between duration of work on computer (hours per day) and development of computer vision syndrome (Table 5).

DISCUSSION

In the present study, the prevalence of Computer Vision Syndrome among the Computer Science students of ACS College of Engineering, Bengaluru was found to be 86.67%. Study conducted by Logaraj et al., on Medical & Engineering students of Chennai reported prevalence similar to our study as 80.3%.[9] Study conducted by Reddy SC et al on university students of Malaysia also reported prevalence of CVS similar to our study i.e. 89.9%. [13] In contrast to our study, much lower prevalence of CVS was reported by Subratty and Korumtolee [14] i.e.59.5% and Pulla A et al [15] i.e. 60.3%.

The most common symptoms of Computer Vision Syndrome reported in the present study were headache (83.5%), eye strain (64.6%) and backache (55.5%). Similarly in the study by Pulla et al also Headache (50.4%) and eye strain/ fatigue (46.7%) were the most common symptoms. [15] Megwas and Daguboshim also reported that headache (41.8 %), pain (31.6 %) and eye strain (26.7 %) as the most prevalent ocular symptoms. [16]

Computer Vision Syndrome was more frequent among students (63.9%) working on Computer for 4-6 hrs per day. Prevalence of CVS among students who used Computers for ≥4hrs per day was 94.6%.Similarly CVS symptoms were commonly observed among the students 64.36% who used computers for more than 4 hours in the study by Khola N et al. [7]

A highly significant association was found between Computer Vision Syndrome and the following sitting arrangements i.e. chair support to lower back, keeping

computer screen at eye level, monitor can be tilted/raised/lowered and screen having a glare filter (p < 0.001) whereas Venkatesh SH et. al. study did not find significant association between computer vision syndrome and sitting arrangements. [17]

In present study, highly significant association was found between duration of work on computer (hours per day) and development of Computer Vision Syndrome (p < 0.001). Similar findings were observed in studies by Logaraj M et al, [1] Das S et.al, [4] Pulla A et al [15] and Zairina AR et al. [18]

No significant association was found between gender and computer vision syndrome in the present study which is in contrast to the findings of study by Mani S et.al. [19]

CONCLUSION

The present study concludes that Computer Vision Syndrome is highly frequent among the Computer Science students, which emphasizes the need to update the students with necessary knowledge regarding the preventive aspects of the condition. Also a highly significant association was found between Computer Vision Syndrome and the certain sitting arrangements and increased duration of work on Computer (hours per day).

Recommendation: In this computer era there is no scope to avoid this modern technology rather its use is expanding everyday in the perspective of global digitalization. Health education to create awareness among the computer users regarding its proper uses in respect of optimum amount of work time, proper workplace design and lighting control, work positions, related health & eye problems, good preventive vision care habits and regular professional eye care along with some training to the users to solve the common problems can be provided, to reduce or eliminate Computer Vision Syndrome. [20,21]

It is also recommended to follow the rule of 20/20/20 to reduce the symptoms of computer vision. The rule of 20/20/20 states that while using Computers, every 20 minutes, focus the eye on an object 20 feet (6 meters) away for 20 seconds and give your eyes the break they deserve. [10,15]

Limitations of Study: The main limitations of the present study were that ophthalmic examination was not done to measure CVS & the symptoms were self-reported. The study did not involve examination of their practices while they were actually working on their computers, so the self-reported measurements like viewing distance and length of time they work may be less accurate. Also the findings of this study cannot be generalized to whole community as Computer Science students of only one engineering college were selected to carry out this study.

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