Computer vision syndrome: Are medical students exempted from it?

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Abstract

Introduction: It has been observed that use of computer by medical students is increasing. Study material is becoming more digital, computers are used in many of the diagnostic tests that take place within the hospital. This study was conducted with the aim to study the prevalence, risk factors and clinical evaluation and spread awareness of computer vision syndrome among medical students.

Materials and Methods: This Cross sectional study was conducted at a Medical college in Pune. The questionnaire was allotted to students in campus of medical College, those who were found to be symptomatic were further evaluated in Out Patient Department of Ophthalmology data analyzed by using SPSS software version 17.0. Statistical tools used were proportions & percentages & other appropriate. Statistical tests of significance applied.

Result: the prevalence of computer vision syndrome was 54.44%. using computers for 6-8hours have higher percentage (39.12%) & duration more than 6-8 years of using computers 29.02% students suffering from computer vision syndrome (cvs). ocular & non ocular symptomps were statistically significant.

Conclusion: The prevalence of computer vision syndrome amongst medical student was 54.44%. Factors to relieve symptoms were also studied and it is found that awareness of CVS definitely reduce symptoms.

Keywords: Computer vision syndrome, Digital eye strain, Visual display unit.

Introduction

The digital revolution has launched a new era of human empowerment, Never before has there been a more powerful influence on human behavior, irrespective of work profile, country or culture, bys the combined effect of digital technologies. Technological advances create incredible new solutions, but present new difficulties as well.

Computers, Ipads, cell phones with visual display units (VDU); have made day to day activity effortless in all fields of life. All this productivity often means that we spend a lot of time staring at screens: our work computers, our home laptops, and our smartphones. Computers with visual display units (VDU) have been made smarter moving from desk to mobile phones. It has also led to increased number of patients complaining about ocular and non ocularsymptoms.[1] The increasing use of computers has brought about a much higher incidence of various health problems: visual complaints, ocular and extraocular discomfort (headache and musculoskeletal problems.[1-3]

Computer Vision Syndrome, (CVS) referred to as digital eye strain, describes a group of eye and vision-related problems that result from prolonged computer, tablet, e-reader and cell phone use. According to the US National Institute for Occupational Safety and Health, computer vision syndrome affects about 90% of the people who spend three hours or more a day at a computer.[4] It has been observed that use of computer by medical students is also increasing. Study material is becoming more digital, portable document format (PDF) aided lectures are taken for better understanding, computers arSe used in many of the diagnostic tests that take place within the hospital as well as use of internet has also increased concerning to study material, surgical videos, communication, transfer of iles. Nowadays Computers are just not restricted to offices or particular occupation but has found a way into every individual's lifestyle. Thus the present study was designed to assess the prevalence of Computer Vision Syndrome (CVS) among medical students and modifiable ergonomic factors associated with the same.

Materials and Methods

This study was conducted with the aim to study the prevalence, risk factors and clinical evaluation of computer vision syndrome among medical students.

This cross sectional study was conducted at a Medical college in Pune. The study consisted of a questionnaire and ophthalmic evaluation. The questionnaire was allotted to students in campus of medical college, for clinical evaluation students were examined at ophthalmology outpatient department of the Medical College. The duration of the study was 6 months. All under graduate and post graduate students who worked daily on computers, used mobile phones and tablets prior to starting the study were included. Students with history of refractive surgery and any other ocular surgery, students on eye drops for any ocular conditions at time of study were excluded. Thus by using the above mentioned inclusion and exclusion criteria total 709 students were enrolled.

Institute Ethics Committee Clearance was obtained before starting the study. Also the permission was taken from The Dean of Medical College to interview their students. The participants were surveyed using a

structured questionnaire based on the knowledge of previous studies, which included the basic demographic profile, hours of computer use per day, frequency of break taken while working on computers.

Those who were found to be symptomatic were further evaluated in Out Patient Department of Ophthalmology of Medical College, Hospital and Research Centre, Pune. Computer vision syndrome is defined as ''the complex of eye and vision problems related to near work, which are experienced during or related to computer use has been termed "CVS".[5] The eye symptoms were redness, burning sensation of eye, headache, blurred vision and dry eyes etc.[6,7] these symtoms were assesed on a likert scale like always, sometimes, never. Students' demographic, personal details including name, age, sex, OPD number, occupation, place of residence, qualification was recorded. Also all students were evaluated for any systemic illness or whether they are having any past history of ocular trauma or history of any medication and were recorded in Pro-forma. A detailed ocular history as well as past and personal history was recorded. General ophthalmic examination of both eyes was performed, vision assessment uncorrected visual acuity [UCVA], pinhole, best corrected visual acuity [BCVA], near vision were assesed using Snellen's chart, anterior segment examination was done on Slit lamp, Fundus examination through undiated pupil was done on slit lamp with aid of +90 Diopter lens. For staining tests fluroscein impregnated strips were used, Tear break up time (TBUT) is recorded A TBUT value <10 s was considered abnormal. Schirmer test was performed without topical anesthesia using standardized Whatman filter paper.[8,9]

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Data Collection:
Step I: Designing of Questionnaire.
A semi-structured questionnaire was prepared and validated with study subject and study expert in peer and modified with reference to study objectives.
Step II: The semi-structured questionnaire was administered to the medical students who meet the eligibility criteria
Step III: Information was obtained from students including personal baseline data profile, Symptoms & Signs of computer vision syndrome were looked for in opd.
Data Analysis: Data analysis of the present study includes following steps.
Step I: all responses were tabulated by the investigator using Microsoft-Excel 2007 Software. Graphical representations were made wherever necessary.
Step II: Data analyzed by using SPSS software version 17.0. Statistical tools used were proportions & percentages & other appropriate. Statistical tests of significance.

Results

The present study was conducted among the medical students. Total number of students enrolled were 709.

Table 1: Prevalence of CVS

	Number	%
CVS present	386	54.44%
CVS absent	323	45.56%
Total	709	100

In the present study the prevalence of computer vision syndrome was 54.44%.

Table 2: Average hours spent on computer daily

Hrs/Day	Number	%
1-2 hours	81	20.98%
3-5 hours	123	31.87%
6-8 hours	151	39.12%
>8 hours	31	8.03%
Total	386	

It was seen that majority of the students suffering from computer vision syndrome were using computer, laptop, mobile phone daily (VDU) for 6-8hours (39.12%) followed by 3-5hours (31.87%) and 1-2 hours (20.98%).

Table 3. Duration of computer use

Duration of computer use		
Duration	**Number**	**%**
<1 year	5	1.30%
1-2 years	62	16.06%
3-5 years	110	28.50%
6-8 years	112	29.02%
>8 years	97	25.13%
Total	386	

It was observed that 29.02% students suffering from computer vision syndrome were using computers with visual display units since 6-8years whereas 28.50% students using computers since 3-5 years. Majority of the medical students were using computers with VDU since 3-8 years.

Table 4: CVS symptoms

Symptoms	Number	%
Headache	206	53.37%
Eye strain	178	46.11%
Dry eye	150	38.86%
Blurred vision	119	30.83%
Watery eye	51	13.21%
Red eye	21	5.44%
Discomfort	9	2.33%
Double vision	2	0.52%

The most common presenting symptom observed among the study students was headache (53.37%) followed by eye strain (46.11%) and dry eye (38.86%).
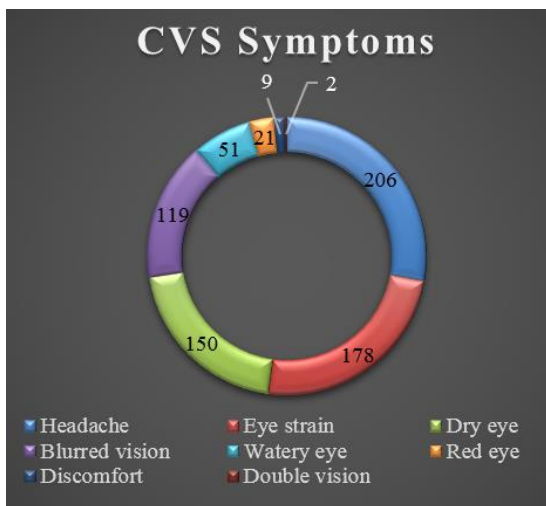
Table 5: Non-ocular symptoms observed in students along with CVS

	Number	**%**
Neck pain	46	11.92%
Backache	34	8.81%
Shoulder pain	21	5.44%

In the present study it was observed that among the non-ocular symptoms neck pain (11.92%) was the most common presenting symptom.

Table 6: Relation between CVS symptoms and the average number of hours spent on computer

Hours		1-2hrs	3-5hrs	6-8hrs	>8hrs	Total	P value
Headache	Y	27	70	111	22	230	0.000*
	N	39	56	44	16	156	
Eye strain	Y	22	52	119	2	195	0.000*
	N	44	75	36	36	191	
Dry eye	Y	4	4	131	37	177	0.000*
	N	62	123	24	1	209	
Blurred vision	Y	22	37	55	16	130	0.161
	N	45	89	100	22	256	
Watery eye	Y	6	4	46	3	59	0.000*
	N	60	123	109	35	327	
Red eye	Y	5	6	21	0	32	0.000*
	N	62	121	134	38	354	
Discomfort	Y	10	9	2	0	21	0.000*
	N	56	118	153	38	365	
Double vision	Y	0	0	1	0	1	0.394
	N	66	127	154	38	385	

* Statistically Significant

In the present study relation between symptoms of computer vision syndrome and average number of hours spent on computer was studied. And it was observed that majority of the symptoms were having statistically significant association with increasing hours of computer use.

Table 7: Relation between non ocular symptoms and the average number of hours spent on computer

Hours		1-2hrs	3-5hrs	6-8hrs	>8hrs	Total	P value
Neck pain	Y	6	9	40	5	60	0.000*
	N	60	118	115	33	326	
Backache	Y	9	14	20	4	46	0.759
	N	57	113	135	34	340	
Shoulder pain	Y	3	5	15	4	27	0.016*
	N	63	122	140	34	359	

* Statistically Significant

It was seen that neck pain and shoulder pain had significant association with the average numbers of hours spent on computer.

Table 8: Relation between CVS symptoms and the duration of computer use

		<1 year	1-2 years	3-5 years	6-8 years	>8 years	Total	P value
Headache	Y	2	33	78	96	22	230	0.000*
	N	24	39	36	14	43	156	
Eye strain	Y	11	25	56	84	19	195	0.000*
	N	15	46	58	26	46	191	
Dry eye	Y	2	5	22	85	64	177	0.000*
	N	24	67	93	25	1	209	
Blurred vision	Y	2	21	37	54	17	130	0.000*
	N	24	51	78	55	48	256	
Watery eye	Y	2	5	3	47	3	59	0.000*
	N	24	66	112	62	62	327	
Red eye	Y	2	4	5	21	0	32	0.000*
	N	24	67	109	89	65	354	
Discomfort	Y	8	10	0	2	1	21	0.000*
	N	18	62	115	107	64	365	
Double vision	Y	0	0	0	1	1	1	0.599
	N	26	72	115	109	64	385	

* Statistically Significant

The Relation between CVS symptoms and the Duration of computer use was also studied. It was observed that there was significant association between the duration of computer use and symptoms

Table 9: Relation between non ocular symptoms and the duration of computer use

		<1 year	1-2 years	3-5 years	6-8 years	>8 years	Total	P value
Neck pain	Y	2	7	11	30	11	60	0.000*
	N	24	65	104	79	54	326	
Backache	Y	2	12	11	14	7	46	0.364
	N	24	60	104	95	57	340	
Shoulder pain	Y	1	4	5	11	6	27	0.089
	N	25	67	110	98	58	359	

* Statistically Significant.

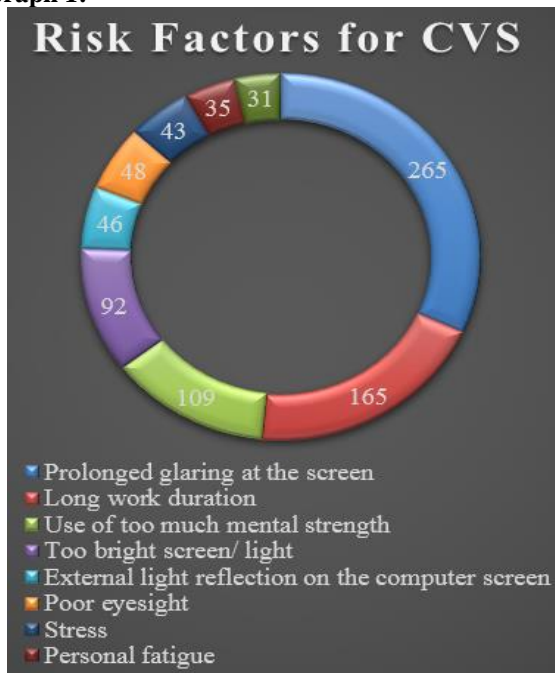It was seen that neck pain had significant association with duration of computer use.

Table 10: Risk factors for CVS

Risk Factors	Number	% of Total CVS present
Prolonged glaring at the screen	265	68.65%
Long work duration	165	42.75%
Use of too much mental strength	109	28.24%
Too bright screen/ light	92	23.83%
External light reflection on the computer screen	46	11.92%
Poor eyesight	48	12.44%
Stress	43	11.14%
Personal fatigue	35	9.07%
Poor ventilation	31	8.03%

Various risk factors have been observed to be associated computer vision syndrome. Prolonged glaring at the screen was reported by 68.65% of students followed by long work duration (42.78%) and use of too much mental strength (28.24%). Too bright screen/ light (23.83%), external light reflection on the computer screen (11.92%), poor eyesight (12.44%), stress (11.14%), personal fatigue (9.07%) and poor ventilation (8.03%) were the other risk factors observed in the present study.\

Graph 1:

Risk Factors for CVS

- Prolonged glaring at the screen
- Long work duration
- Use of too much mental strength
- Too bright screen/ light
- External light reflection on the computer screen
- Poor eyesight
- Stress
- Personal fatigue

It was observed that 35.23% students were taking regular breaks to get relief from the computer vision syndrome. Closing eyes (31.87%) and using glare screen on the computer (28.24%) were the other measures used by the students.
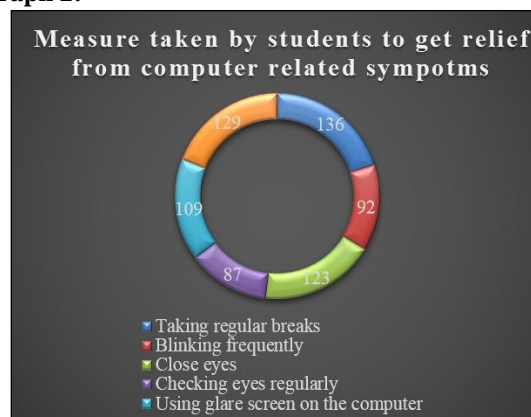
Graph 2:

Measure taken by students to get relief from computer related sympotms

- Taking regular breaks
- Blinking frequently
- Close eyes
- Checking eyes regularly
- Using glare screen on the computer

Table No 12. Schirmer's test result

Scale	1-2hrs	3-5hrs	6-8hrs	>8hrs
0-5mm	4	10	36	58
6-10mm	10	31	43	71
>10mm	77	27	14	4

It was observed that schirmer's test result less than 5 mm was found in 94 (24.35%) students using computers more than 6 hours.
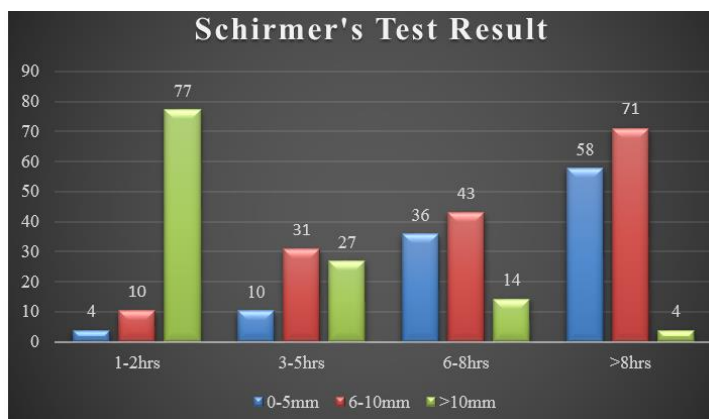
Table 11 Measure taken by students to get relief from computer-related symptom

Measure	Number	%
Taking regular breaks	136	35.23%
Blinking frequently	92	23.83%
Close eyes	123	31.87%
Checking eyes regularly	87	22.54%
Using glare screen on the computer	109	28.24%
Nothing	129	33.42%

Graph 3:

Schirmer's Test Result

0-5mm, 6-10mm, >10mm

Table 13: Tear break-up time test result

Tear Break-up Time Test				
Time	1-2hrs	3-5hrs	6-8hrs	>8hrs
0-4 Sec	0	7	46	54
5-10 Sec	39	31	35	61
>10 Sec	77	31	4	1

Tear break up time was lesser in students using computers more than 8 hours, normal in students using computers less than 1-2 hours.
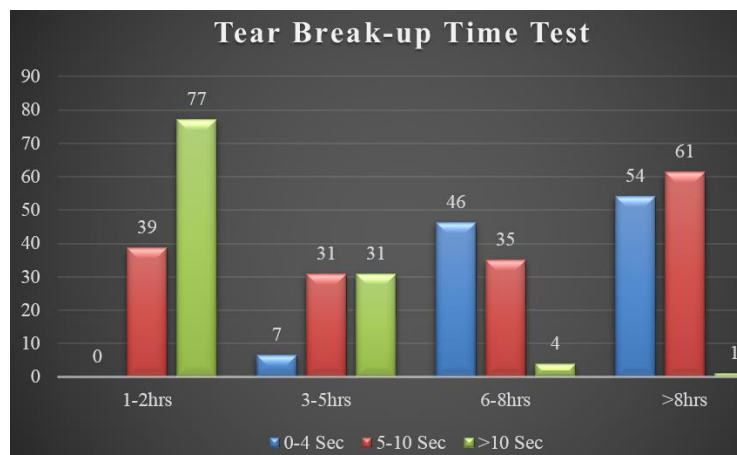
Discussion

The present study was conducted among the medical students. Total number of students enrolled were 709 the revalence of computer vision syndrome was 54.44%. NIOSH survey (National Institute of Occupational Safety and Health) has reported that visual symptoms occur in 75-90 % of VDT workers as opposed to 22% musculoskeletal disorders (carpel tunnel syndrome) in computer users[10] numerous studies have been done to find out prevalence of computer vision syndrome in university students, but medical students are not always included. Prevalence of 54.44% indicates the increase in dependency on computers in form of mobile smart phones with their visual display unit by medical college graduate and post graduate students. Lograj et al found prevalence of computer vision syndrome in engineers were 81.9% and 78.6% in medical students.[11] Study conducted by Reddy et al in Malaysia found prevalence of 89.9%,[12] but the study does not mention inclusion of medical students. Study conducted by Venkatesh et al found eye strain (53.9%) followed by headache (38.5%) as disturbing symptoms.[13] While Bali et al found 81.7% of the study population had headache.[1] The difference in the prevalence rate of computer-related problems in various studies depend upon factors like knowledge and awareness levels, workstation set up, degree of immobilization and levels of constrained postures, and practices of workers regarding computer ergonomics[15]. In the present study relation between symptoms of computer vision syndrome and average number of hours spent on computer was studied and it was observed that majority of the symptoms like headache, eyestrain, dry eye, blurred vision, and red eye were having statistically significant association with increasing hours of computer use. It was observed that there was significant association between the duration of computer use and symptoms (Table 6 and Table 8). Prolonged staring at visual display units of computers results in infrequent blinking, thus results on symptoms of dry eye. Resting point of accommodation is the distance at which the eye focuses when there is nothing to look at. It is differs with every individual. Jaschinski-Kruza (1988) found that uninterrupted viewing of a computer monitor closer than the resting point of accommodation contributed to eye strain.[16] The ciliary muscle must work two and a half times harder to focus on a monitor 12 inches away than it does to focus at 30 inches (Fischer, 1977).[16] This results in symtoms like eyestrain, blurred vision for distance after prolonged computer viewing. Study conducted by Lograj et al also found similar results, students who were using computer for 4-6 h were at significantly higher risk of developing redness, burning sensation and dry eyes compared to those who use computer for less than 4 hours.[11] Shrivastava and Bobhate report found that visual symptoms increased with the increase in working hours on the computer.[17] It was seen that neck pain and shoulder pain had statistical significant association with the average numbers of hours spent on computer and duration of computer use. (Table 7 and table 9). Lograj et al did not find statistical significance between non ocular symtoms in students using computers more than 6 hours. Neck pain was complained more by students using computers 4 to 6 hours than use more than 6 to 8 hours.[11] We found numerous risk factors associated with computer vision syndrome like prolonged glaring at the screen was reported by 68.65% of students followed by long work duration (42.78%) and use of too much mental strength (28.24%). Too bright screen/light (23.83%), external light reflection on the computer screen (11.92%), poor eyesight (12.44%), stress (11.14%), personal fatigue (9.07%) and poor ventilation (8.03%). The visual symptoms can largely be resolved with proper management of the environment and by providing proper visual care for the employee using visual display units.[18] It was observed that 35.23% students were taking regular breaks to get relief from the computer vision syndrome. Closing eyes (31.87%) and using glare screen on the computer (28.24%) were the other measures used by the students. 73.1% of subjects who had CVS symptoms did not use antiglare screen during computer use (P-0.05) in the study conducted by Venkatesh et al.[13] Our study

findings similar to Talwar et al who found 85.2% having symptoms did not use antiglare filters.[19.] According to Mc Lean et al[20] taking regular small breaks may relax accommodation process of the eyes, thereby preventing eyestrain.

Taking regular small breaks may relax accommodation process of the eyes, thereby preventing eyestrain. Taking breaks in between the use of computer was the most common preventive measure taken for relief of symptoms of CVS It was observed that schirmer's test result less than 5 mm was found in 94 (24.35%) students using computers more than 6 hours. Aurora Gajata et al found among the eyes in the analysis, the Schirmer I test value was less than 5 mm in 45% of subjects (dry eye) in the group A which used computers more than 8 hours, less than 10 mm in 42% (risk of dry eye), 15 mm (normal value) in 13%, compare to group B which ocassionaly used computers, where normal values larger than 15 mm were found in 73,33% of the total subjects.[21] Tear break up time was lesser in students using computers more than 8 hours, normal in students using computers less than 1-2 hours. Bhargava et al in study of oral omega 3 fatty acids in treatment of computer vision syndrome stated that Schirmer's test was abnormal in 33% symptomatic computer users at baseline. Tear film break up time was abnormal in 55% symptomatic computer users at baseline before starting the treatment. Report of the Definition and Classification Subcommittee of the International Dry Eye WorkShop (2007) classified low blinking rate resulting in intrinsic cause of evaporative dry eye.

Occupational factors may cause a slow blink rate, representing a risk for dry eye in those working with video display terminals.[23] The study implies the importance of good working environment and preventive measures to be taken in order to prevent computer vision syndrome. Steps to reduce computer eyestrain have been suggested by the National Institute of Health and Occupational Safety like regular eye examination, frequent conscious blinking, Taking breaks, refocusing on a distant object and minimizing glare.

Limitation of this study was we have taken students for examinations which are symptomatic. considering symptomatic patients would be having positive sign hence they were further evaluated further. Hence there is scope of further comparative study between symptomatic and non-symptomatic students. The backbone of any care program is the capability of the doctors who are providers for that program.[5] These students are the torch bearers for the future generations. Awareness of visual symptoms is a must amongst these students, incorporation of good visual and postural habits will improve the productivity and prevent visual stress.

Conclusion

The prevalence of computer vision syndrome amongst medical student was 54.44%. It was observed that there was significant association between the duration of computer use and symptoms. Symptoms increased with longer hours of computer work and other similar devices. This is in line with reports of other studies.[23]

Almost 68.13% did not use any precautionary measures like consciously closing eye while 71.76% did not use antiglare screens. Schirmers test result was low as well as tear break up time was reduced in students suffering from computer vision syndrome.

Considering the prevalence of computer vision syndrome in medical students, importance of this topic should be included in curriculum, adequate knowledge and appropriates practices if adopted will surely help the students.

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