

Figure 1: Percentage of medical and engineering students reported computer vision syndrome. (Mild, moderate and severe cases amalgamated)

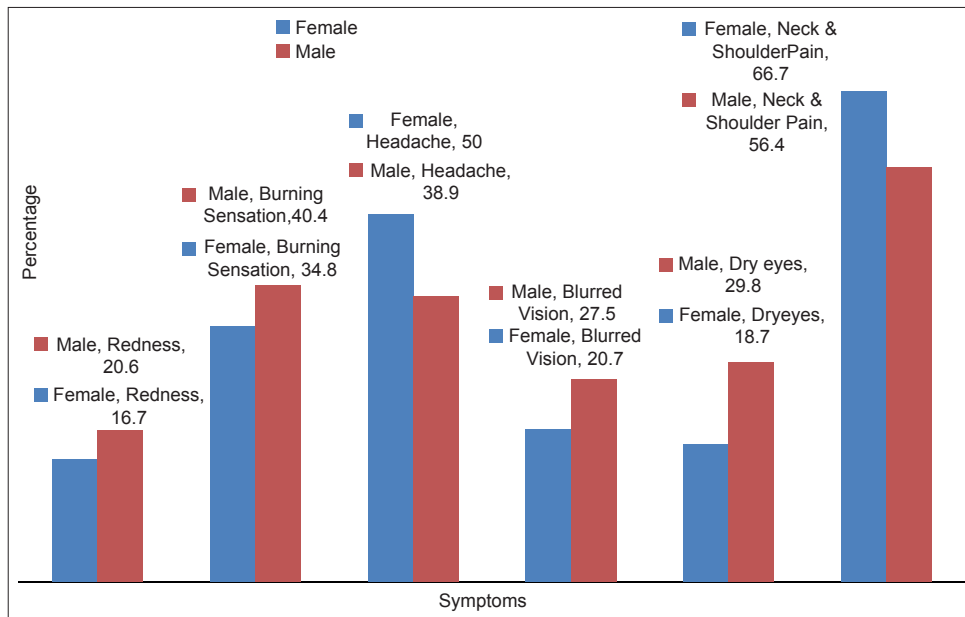


Figure 2: Percentage of female and male students reported computer vision syndrome. (Mild, moderate and severe cases amalgamated)

Redness

About 13.9% of the medical and 23.3% (50/215) of engineering students reported redness. In contrast, higher prevalence of 40.2% and 40.7% symptom of redness was reported by Shrivastava and Bobhate, and Talwar *et al.*, among computer professional respectively.^[15,16]

Burning sensation

Nearly 32.3% of medical students and 42.8% engineering students reported burning sensation. Lower prevalence of 28.9% was reported by Talwar *et al.*, while Sen and Richardson, reported 55% among undergraduates.^[2,16] Similar finding of 54.6% of prevalence of burning sensation

was reported by Costa *et al.*, among call center workers in Brazil.^[17]

Headache

About 43.3% medical and 45% of engineering students reported headache. Lower prevalence of 29.9% was reported by Talwar *et al.*, while Sen and Richardson, reported 61% among undergraduates.^[2,16] Kesavachandran *et al.*, reported 17% of the employees at information technology suffered from headache.^[18]

Blurred vision

The engineering students were at 2.4 times at higher risk of developing blurred vision compared to medical students and it

Table 3: Association between frequency of break and CVS

Symptoms	Frequency of break	CVS present	CVS absent	OR	95% CI	P value	Kendalls r
Redness	Every 1 h (n=290)	52	238	1	-	-	0.036
	Every 2 h (n=84)	17	67	1.161	0.630-2.139	0.63	
	Every 3 h (n=42)	9	33	1.248	0.563-2.766	0.58	
Burning sensation	Every 1 h (n=290)	105	185	1	-	-	0.035
	Every 2 h (n=84)	38	46	1.455	0.850-2.380	0.13	
	Every 3 h (n=42)	14	28	0.881	0.444-1.747	0.72	
Headache	Every 1 h (n=290)	124	166	1	-	-	0.046
	Every 2 h (n=84)	39	45	1.160	0.712-1.889	0.55	
	Every 3 h (n=42)	21	21	1.338	0.700-2.559	0.38	
Blurred vision	Every 1 h (n=290)	59	231	1	-	-	0.125**
	Every 2 h (n=84)	30	54	2.175	1.280-3.695	<0.01	
	Every 3 h (n=42)	12	30	1.600	0.772-3.315	0.23	
Dry eye	Every 1 h (n=290)	58	232	1	-	-	0.143**
	Every 2 h (n=84)	32	52	2.519	1.436-4.418	<0.001	
	Every 3 h (n=42)	12	30	1.600	0.772-3.315	0.21	
Neck and and shoulder pain	Every 1 h (n=290)	167	123	1	-	-	0.091
	Every 2 h (n=84)	65	19	2.519	1.436-4.418	<0.001	
	Every 3 h (n=42)	23	19	0.891	0.465-1.709	0.73	

Mild, moderate and severe cases amalgamated. **Correlation is significant at the 0.01 level (2-tailed), *Correlation is significant at the 0.05 level (2-tailed). CVS: Computer vision syndrome, OR: Odds ratio, CI: Confidence interval

was statistically significant. Nearly 16.4% of medical students and 31.6% of engineering students reported blurring of vision while it was 13.2% as reported by Talwar *et al.*,^[16] Other studies also supports the association of blurred vision with computer use.^[1,19,20] Rosenfield had reported in his study, a significant difference in the median score with regard to blurred vision during the computer task compared to with a hard copy printout of the material.^[3]

Dry eyes

Nearly 18.6% of the females and 30% of the males reported dry eyes following computer use. In contrast, Uchino *et al.*, observed symptoms of dry eyes in 10.1% of male and 21.5% of female Japanese office workers using VDTs.^[21] Xu *et al.*, Schaumberg *et al.*, and Gayton, have also observed higher prevalence in women than men.^[22-24] Dry eyes is more commonly encountered in women, elderly and contact lens wearers and not common in the younger age group and non-contact lens users.^[25-27] Our study showed that there was a statistically significant difference in prevalence of dry eyes between engineering and medical students indicating that the engineering students were at greater risk of developing dry eyes compared to the medical students. When seated in front of a computer for an extended period of time, blinking may drop by 60%. The reduced blink rates while sitting at a computer monitor contributes to poor tear production and temporarily stresses the cornea, resulting in dry eyes.^[28] To substantiate the finding our study results also showed nearly 53.9% (116/215) the engineering students were viewing computer for more than 4 h/day compare to medical students where only 14.9% (30/201) were viewing computer for more than 4 h. In our study, contact lens users were at higher risk of developing dry eyes 40.8% (20/49) compared to

non-users 22.3% (82/367) (OR = 2.4). Nichols *et al.*, have reported contact lens wearers were 12 times more likely than emmetropes and 5 times more likely than spectacle wearers to report dry eye symptoms.^[29]

Neck and shoulder pain

Nearly 61% of the students had reported neck and shoulder pain. Similar findings were reported by Wahlstrom, in their study.^[30] Students who were using computer for 4-6 h were at higher risk of developing neck and shoulder pain (OR = 1.5) compared to students who were using less than 4 h, but it was not statistically significant. Jacobs and Baker, have reported in their study a significant association between the number of hours on the computer and overall musculoskeletal discomfort. The prevalence of neck, shoulder and arm symptoms in computer workers were as high as 62%.^[31] In contrast, Diepenmaat *et al.*, have reported a low prevalence of neck/shoulder pain (11.5%) among adolescents.^[32]

In our study, males had lesser risk of developing symptoms of headache and neck and shoulder pain compared to females and it was statistically significant. A similar finding was reported by Diepenmaat *et al.*, the prevalence of neck/shoulder pain higher among girls compared to boys.^[32]

Hours of usage of computer and CVS

The present study found that an increase in the number of hours spent on computer increases the risk of CVS significantly. Statistical significance was seen for redness, burning sensation and dry eyes, but not for other symptoms. Respondents who spend less than 1 h on computer daily reported the lowest visual symptoms.^[4] Shrivastava and Bobhate report found that visual symptoms increased with the increase in working hours on the

computer.^[15] Rahman and Sanip, in their study reported that those respondents who used computer for more than 5 h/day were at higher risk of developing CVS.^[9] Previous studies have also shown that computer users are at increased risk of having such visual symptoms.^[19,33]

Contact lens users and CVS

Contact lens users were at higher risk of developing all the symptoms of CVS and it was statistically significant for headache, blurred vision and dry eyes. Many studies have reported the significant association of wearing of contact lens with dry eyes.^[9,34] Subratty and Korumtolee, reported symptoms of CVS were more in spectacle-wearers, compared to non-spectacle users.^[10]

Taking frequent breaks and CVS

Students who took frequent break were at lower risk of developing symptoms of CVS compared those who did not take. An Australian study among 1000 computer workers showed a reduction in the symptoms of asthenopia by optimizing ergonomic desk and frequent work breaks.^[35] Taking short breaks of 5 min for every hour has been shown to decrease discomfort (eye and musculoskeletal) while not impeding productivity.^[36] Many studies recommend frequent breaks to avoid CVS.^[8,37,38] Brewer *et al.*, in their systemic review concluded that the evidence was insufficient to conclude that rest breaks have an effect on visual outcomes with only one study examining this association and finding both positive and no effects.^[39]

The main limitation includes, the study was cross-sectional and it was purposive sampling involving students of a single university. The study did not include ophthalmic examination and the symptoms reported were self-reported.

Conclusions

The present study revealed more than three-fourth of the students complained of any one of the symptoms of CVS while working on computers. Engineering students (computer science and information technology) were at higher risk of developing CVS compared With medical students. Those students who were using computer continuously for more hours were at higher risk developing CVS syndrome compared to students who spend less hours and took frequent breaks. Even though, use of computer had not yet proven to cause any permanent damage to eyes, but studies have proven that temporary discomfort reduces the efficiency of work and thereby productivity. Health and Education professionals have suggested the need for teachers and students to be ergonomically conscious when using computers.^[12,40-43] As the use of computer had become universal in higher education institutions, the subject of the prevention of CVS and associated discomfort should be made part of the curriculum in higher institutions.

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