Original Research Article

Prevalence and associated factors of computer vision syndrome among the computer engineering students of Pokhara University affiliated colleges of Kathmandu valley

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ABSTRACT

Background: The increasing use of computers and electronic devices is rapidly increasing the related health issues of computer vision syndrome. Studies have identified longer use of computers, ergonomic practices as lighting condition of room, incorrect distance between eye and computer, refresh rate, use of spectacles were associated with computer vision syndrome (CVS) symptoms as back pain, tension, headache and others. The objective of this study was to find out the prevalence of CVS among computer engineering students of Pokhara University affiliated colleges of Kathmandu Valley and identify the associated factors and preventive measures being practiced by the students.

Methods: A cross-sectional descriptive study was carried out using self-administered questionnaire among 234 undergraduate computer engineering students of Kathmandu Valley. Chi-square test was used to identify the association with computer vision syndrome and its determinants.

Results: The prevalence of computer vision syndrome among the computer engineering students was found to be 76.50%. Only 39.3% were found to be using computer in upright with straight back posture and 73.5% were using computer at distance less than or equal to 50 cm. The 81.2% of participants were not following the 20/20/20 rule. During age, use of vision aid lens and use of protective eye glasses and artificial eye drops were found associated with CVS.

Conclusions: The study revealed that the prevalence of computer vision syndrome was significantly high. Individuals using vision aid lens were found to be at risk of developing CVS and use of protective eye glass and artificial tears were found protective.

Keywords: Computer vision syndrome, Computer engineering students, Eye issues, Nepal

INTRODUCTION

The American Optometric Association defines computer vision syndrome (CVS) or digital eye strain as "a complex of eye and vision problems related to activities, which stress the near vision and which are experienced in relation or during the use of computer".[1] Symptoms of computer vision syndrome are broadly classified into four categories i.e. asthenopic-sore eyes, eye strain, ocular surface related-dry eye, irritation, watering, visual-double vision, blurred vision, slowness of focus change, extra ocular-shoulder pain, neck pain, back ache.[2]

The increasing use of computers and electronic devices is rapidly increasing the related health issues of computer vision syndrome.[2] Studies have identified longer use of computers, ergonomic practices as infrequent blinking, lighting condition of room, incorrect distance between

eye and computer, refresh rate, use of spectacles were associated with CVS symptoms as back pain, tension, headache and others.[3-6] The studies have identified that 64% to 90% of computer users have problem of CVS.[4] The objective of this study was to find out the prevalence of CVS among computer engineering students of Pokhara University affiliated colleges of Kathmandu Valley and identify the associated factors and preventive measures being practiced by the students.

METHODS

A cross sectional descriptive study was conducted among bachelor level computer engineering students of Pokhara University affiliated colleges of Kathmandu valley from May 2019 to October 2019. Total of 234 samples were randomly selected from the finite population of 662 with 95 % level of confidence interval, 0.05 allowable errors and considering 10% non-response rate. The reference prevalence was taken as 72%.[7] Three colleges were randomly selected and samples were collected from the students of second, fourth, sixth and eighth semester i.e. running semester of the colleges during the time of study. All the bachelor level computer engineering students from those colleges were included. Participants with near-sightedness and far-sightedness were also included. While participants with other than above mentioned two eye conditions were excluded. Those who refused to participate and were absent were also excluded.

The study reported the perceived symptoms, perceived behaviour and perceived knowledge of study participants related to CVS. CVS-Q (Computer Vision Syndrome questionnaires) was used to measure computer vision syndrome.[8] Socio-demographic, knowledge, personal factors, environmental factors and preventive factors related variables were also measured. Self-administered method was used for data collection. To measure computer vision syndrome, frequency and intensity scores were used. Frequency was measured as never, occasionally and often/always with assigned value of 0, 1 and 2 respectively while intensity was measured as moderate and intense with assigned value of 1 and 2 respectively. The total score of frequency and intensity was summed and the individual with score ≥6 points was considered having the CVS.

Content validity was established by using a standard questionnaire through literature reviews followed by consultation with experts and research supervisor. To reduce information bias, respondents were informed about the research topic and content by researcher.

Pearson Chi-Square test was used to measure the association. The α-level of significance of 5% was used with p value less than 0.05 was considered statistically significant.

Approval letter was taken from the Institutional Review Committee of Nobel College. Informed consent was taken from study participants. Confidentiality and privacy of all respondents was maintained.

RESULTS

The mean age of the students was 20.37±1.378 years (Table 1).

Table 1: Socio-demographic characteristics of participants.

Characteristics	Number	Percentage
Age (in years)		
17-18	21	9
19-21	171	73.1
22-26	42	17.9
Sex		
Male	158	67.5
Female	76	32.5
Religion		
Hindu	220	94
Buddhist	5	2.1
Muslim	5	2.1
Christian	4	1.7
Ethnicity		
Brahmin	103	44
Chhetri	52	22.2
Janajati	50	21.4
Madhesi	27	11.5
Dalits	2	0.9
Marital Status		
Single	225	96.2
Married	4	1.7
Others	5	2.1

Prevalence of computer vision syndrome

The study found that the 76.50% of participants had computer vision syndrome based on their self-perceived characteristics (Figure 1).
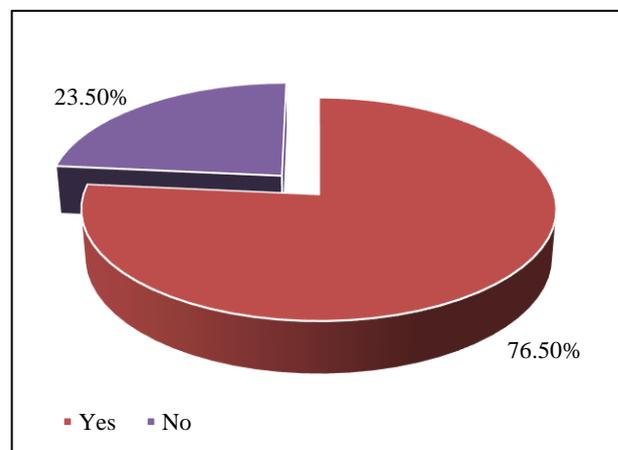
Figure 1: Prevalence of computer vision syndrome.

Table 2: Screen use related characteristics of participants.

Characteristics	Number	Percentage
Part of the day with maximum screen time		
Morning	8	3.4
Day	51	21.8
Night	175	74.8
Sitting position while using computer screen		
Upright with straight back	92	39.3
Bending back	66	28.2
Lying down	76	32.5
Viewing distance of computer screen		
Less than or equal to 50 cm	172	73.5
Greater than 50 cm	62	26.5
Level of computer screen and eye		
Above the level of eyes	24	10.3
At the level of eyes	146	62.4
Below the level of eyes	64	27.4
Hours per day spent on digital screen		
2-4 hours	83	35.5
4-6 hours	91	38.9
>6 hours	60	25.6
Adjust the contrast of computer		
Yes	192	82.1
No	42	17.9
Use of vision aid lens		
Yes	82	35
No	152	65

The study found that about three fourth of study participants were using digital screen in the night time (74.8%). The posture while using digital screen was reported as upright with straight back by 39.3%, lying down by 32.5% and bending back by 28.2%. Many of the participants (73.5%) reported that they have screen to eye distance of ≤50 cm.

The 62.4% of participants reported that they use computer screen at their level of eye. The times spent daily on digital screens were reported as 4 to 6 hours by 38.9%, 2 to 4 hours by 35.5% and more than 6 hours by 25.6%. Only 17.9 % of participants responded that they adjusted the contrast of computer with the surrounding brightness. The use of vision aid lens was reported among 35% of the total study participants (Table 2).

The study found that 18.8% of the participants followed the 20/20/20 rule, 26.1% of the participants used protective eye glasses while using computer and other screens and 26.1% had used artificial eye drops (Table 3).

Table 3: Preventive measures practice.

Preventive measures	Number	Percentage
Follow 20/20/20 rule		
Yes	44	18.8
No	190	81.2
Use of protective eye glasses		
Yes	61	26.1
No	173	73.9
Use of artificial eye drops		
Yes	61	26.1
No	173	73.9

Table 4: Chi-square test results of association between socio demographic variables and prevalence of CVS.

Socio demographic characteristics	CVS		P value
	No	**Yes**	
	N (%)	**N (%)**	
Age group (in years)			
17-18 years	10 (47.6)	11 (52.4)	0.011
19-21 years	39 (22.9)	131 (77.1)	
22-26 years	6 (14)	37 (86)	
Sex			
Male	35 (22.2)	123 (77.8)	0.482
Female	20 (26.3)	56 (73.7)	
Religion			
Hindu	55 (25)	165 (75)	
Other than Hindu	0	14 (100)	0.206
Ethnicity			
Brahmin	21 (20.4)	82 (79.6)	
Chhetri	14 (26.9)	38 (73.1)	0.356
Janajati	10 (20)	40 (80)	
Madhesi and Dalit	10 (29)	19 (71)	
Marital status			
Single	53 (23)	177 (77)	0.207
Married	2 (50)	2 (50)	

The Pearson Chi square test showed association between prevalence of CVS and age groups of study participants (p value=0.011). Sex, religion, ethnicity and marital status were not found associated with prevalence of CVS among the study participants (Table 4). Pearson chi square test was applied to find out the association between screen use related characteristics and prevalence of CVS among study participants. Use of vision aid lens (p value=0.000) was found associated with prevalence of CVS while none of the other characteristics were found to be associated with CVS (Table 5). The pearson chi square test showed association between prevalence of CVS and use of protective eye glasses (p value=0.003) and use of artiicial eye drops (p value=0.006) of study participants. However, following the 20/20/20 was not found to be associated with prevalence of CVS among study participants (Table 6).

Table 5: Chi-square test results of association between screen use related characteristics and prevalence of CVS.

Screen use related characteristics	CVS		P value
	No	Yes	
	N (%)	N (%)	
Part of the day with maximum screen time			
Morning time	4 (50)	4 (50)	0.078
Day time	15 (29.4)	36 (70.6)	
Night time	36 (20.6)	139 (79.4)	
Sitting position while using computer screen			
Upright with straight back	28 (30.4)	64 (69.6)	0.112
Bending back	14 (21.2)	52 (78.8)	
Lying down	13 (17.1)	63 (82.9)	
Viewing distance of computer screen			
Less than or equal to 50 cm	38 (22.1)	134 (77.9)	0.485
Greater than 50 cm	17 (27.4)	45 (72.6)	
Level of computer screen and eye			
Above the level of eyes	3 (12.5)	21 (87.5)	0.11
At the level of eyes	41 (28.1)	105 (71.9)	
Below the level of eyes	11 (17.2)	53 (82.8)	
Hours per day spent on digital screen			
2-4 hours	21 (25.3)	62 (74.7)	0.549
4-6 hours	23 (25.3)	68 (74.7)	
>6 hours	11 (18.3)	49 (81.7)	
Adjust the contrast of computer			
No	13 (31)	29 (69)	0.209
Yes	42 (21.9)	150 (78.1)	
Use of vision aid lens			
No	48 (31.6)	104 (68.4)	0
Yes	7 (8.5)	75 (91.5)	

Table 6: Chi-square test results of association between preventive measures practice and prevalence of CVS

Preventive measures	CVS		P value
	No	Yes	
	N (%)	N (%)	
Follow 20/20/20 rule			
Yes	14 (31.8)	30 (68.2)	0.149
No	41 (21.6)	149 (78.4)	
Use of protective eye glasses			
Yes	6 (9.8)	55 (90.2)	0.003
No	49 (28.3)	124 (71.7)	
Use of artificial eye drops			
Yes	12 (19.7)	48 (80.3)	0.006
No	40 (23.5)	130 (76.5)	

DISCUSSION

This study identified 76.50% of computer engineering students had prevalence of CVS which is slightly higher than the findings of study (i.e. 71.6%) among undergraduate medical students on Kathmandu, Nepal.[7] The slight difference may be due to difference in graduate course of study where computer engineering studies are primarily studying the computer unlike medical students. The study showed that CVS prevalence was high among the higher age group which is not supported by the finding of the other study among medical students.[7] Gender, religion, ethnicity and marital status was not found to be associated with CVS, similar findings were in other studies.[6,7,9] The study found that participants using vision aid lens (glasses) were at high risk of developing CVS than who did not use vision aid lens which is also supported by the finding of another study.[3] The study found that adjusting the contrast of computer was not associated with CVS, another study supports this finding.[6]

The study did not find any association between time of screen use time and prevalence of CVS. The study did not find any association of the posture of screen use with the prevalence CVS, which contrasts the finding of other studies.[6,10] The study did not find any association viewing distance of computer screen and CVS but another study had identified the association.[6] The study did not find any association between level of computer screen being at the level, above or below the level of eye with prevalence of CVS which is similar to the findings of study from Kathmandu, but different than the finding of another study.[7,9] This study found that the hours per day use of computer was not associated with CVS prevalence unlike the finding from another study.[3,7,9]

The study found that use of protective eye glasses and use of eye drops was associated with prevalence of CVS. The use of eye glasses and eye drops was found to be protective against developing CVS. The study found that following 20/20/20 rule was not associated with prevalence of CVS but other study showed the association.[7]

CONCLUSION

The study was conducted among 234 participants who were undergraduates of computer engineering program of Pokhara university affiliated colleges of Kathmandu valley. Maximum of the participants (73.1%) were of age 19 to 21 years. The 67.5% of the participants were male while most of them (94%) were of Hindu religion. Prevalence of computer vision syndrome was found to be 76.5% among the study participants. Maximum participants had the habit of using computer at night time (74.8%), few were using upright with straight back posture (39.3%) while using computers and maximum (73.5%) used the computer at the distance of 50 cm or less. The practice of adjusting contrast of computer was practiced by 82.1% of the participants. Only 18.8% of participants were reported following the 20/20/20 rule while 73.9% did not use any protective eye glasses during computer use and only 26.1% used the artificial eye drops. The result of Pearson chi square test showed that age of participants was associated with prevalence of CVS while sex, religion, ethnicity and marital status was not associated. Similarly, part of the day with maximum screen time, sitting position while using computer screen, viewing distance of computer screen, level of computer screen and eye, hours per day spent on digital screen and adjusting the contrast of computer were not associated with prevalence of CVS but use of vision aid lens was found to be associated. Use of protective eye glasses and use of artificial eye drops was found to be protective of CVS while following 20/20/20 rule was not found to be associated with CVS.

REFERENCES

1. Computer vision syndrome (CVS). American Optometric Association. Available at: http://www.aoa.org/x5374.xml. Accessed on 12 February 2020.
2. Noreen K, Batool Z, Fatima T, Zamir T. Prevalence of computer vision syndrome and its associated risk factors among under graduate medical students. Pak J Ophthalmol. 2016;32(3):140-6.
3. Logaraj M, Madhupriya V, Hegde S. Computer vision syndrome and associated factors among medical and engineering students in Chennai. Ann Med Health Sci Res. 2014;4(2):179-85.
4. Akinbinu T, Mashalla Y. Impact of computer technology on health: computer vision syndrome (CVS). Med Pract. 2014;5(3):20-30.
5. Iqbal M, Massry A, Elagouz M, Elzembely H. Computer vision syndrome survey among the medical students in Sohag University Hospital, Egypt. Ophthalmol Res Int J. 2018;8(1):1-8.
6. Assefa NL, Weldemichael DZ, Alemu HW, Anbesse DH. Prevalence and associated factors of computer vision syndrome among bank workers in Gondar City, northwest Ethiopia, 2015. Clin Optom. 2017;9:67-76.
7. Sitaula KR, Khatri A. Knowledge, attitudes and practice of computer vision syndrome among medical students and its impact on ocular morbidity. J Nepal Health Res Counc. 2018;16(3):291-6.
8. Seguí M, García CJ, Crespo A, Verdú J, Ronda E. A reliable and valid questionnaire was developed to measure computer vision syndrome at the workplace. J Clin Epidemiol. 2015;68(6):662-73.
9. Ranganatha SC, Jailkhani S. Prevalence and associated risk factors of computer vision syndrome among the computer science students of an engineering college of Bengaluru-a cross-sectional study. Galore Int J Health Sci Res. 2019;4(3):10-5.
10. Straker LM, Smith AJ, Bear N, O'Sullivan PB, Klerk NH. Neck/shoulder pain, habitual spinal posture and computer use in adolescents: the importance of gender. Ergonomics. 2011;54(6):539-46.