Original Article

Magnitude and Determinants of Computer Vision Syndrome (CVS) among IT Workers in Kathmandu, Nepal

Sudip Poudel[1], Shankar Prasad Khanal[1]
[1]Central Department of Statistics, Tribhuvan University, Kathmandu, Nepal

Abstract

Introduction: Computer Vision Syndrome (CVS) is developed among computer workers due to long time working with computers or viewing of the video display terminal (VDT). The objective of this study is to determine the magnitude and determinants of CVS symptoms among IT officers.

Materials and methods: A cross sectional study of IT office workers was conducted at Kathmandu from March to April 2019. Self-administrated questionnaire and observation of researcher was applied to collect information. CVS defect was considered if the participants were having minimum of one symptom during /following use of VDT. The proportion of CVS and its association with different independent factors was carried out.

Results: The prevalence of CVS reported by 263 participants was 82.5% (95% CI: 81.3% - 83.6%), of them 163(62.0%) were not aware about bad effects of computers to the visual apparatus. Goggles were used as protection against CVS by 140(53.2%) participants. CVS symptoms included headache 127(48.0%), tired eyes 123(47.0%) and eye strain 114(43.0%). Use of computer for more than 4.75 hours/day experienced CVS. The mean office work included 7.7 ± 2.02 hours computer work. The video display gadgets usage in home was 2.7 ± 2.35 hours/ day.

Not taking breaks (OR:7.3; 95% CI:2.2 - 24.9), not massaging eyes (OR:7.5; 95% CI:1.2 - 47.7), unusual viewing distance (OR:9.0; 95% CI:2.0 - 44.5), improper posture (OR:3.6; 95% CI:1.3 - 10.3), computer usage for more than 10 hours/ day (OR:5.4; 95% CI:1.6 - 18.2) and not aware of CVS (OR:7.2; 95% CI:2.6 - 20.3) were significant predictors of CVS in IT workers.

Conclusion: Most of the IT workers had CVS. Health education and care of IT workers based on predictors found need to be strengthened in the study area.

Key words: Computer Vision Syndrome, Visual Display Terminal, Eyesight Quality, Digital Eyestrain.

Introduction

Computer vision syndrome (CVS) is one of the major occupational risks in this century. According to American Optometric Association (AOA), CVS and its symptoms affect 70% of computer users. Worldwide, CVS is one of the key public health complications which decreases the work productivity, reduces job

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Corresponding author
Shankar Prasad Khanal
Central Department of Statistics, Tribhuvan University
Kathmandu, Nepal
E-mail: drshankarcds@gmail.com

satisfaction, increases the rate of mistakes, and considerably weakens the visual strengths of eyes (Wimalasundera, 2009). Nearly 60M people suffer from CVS and 1M new cases occur each year (Wimalasundera, 2009). The computer releases electromagnetic radiations consequently high energy related stress has been developed to the ciliary muscles. Thus, prolonged exposure to the computer screen leads to eye strain. In view of limited personal protective tools and their usage, high workload, and limited break time while working with computers / VDT in countries like Nepal, the problem of CVS has risen. It is a matter of concern for policy makers.

Computer use has increased for information and communication in most organizations in Nepal. However, norms and guidelines for using computers, and using television and smartphones are lacking resulting in overwhelming symptoms among users.

Bad lighting conditions, long time use of computer, brightness of the screen, refractive errors and not proper workstation setup are main risk factors for CVS (Ihemedu & Omolase, 2010; Torrey, 2003). Though, there is no evidence that CVS symptoms lead to permanent eye damage but negatively affects efficiency at the workplace. CVS reduces productivity in the workplace (Torrey, 2003). Corrected refractive error leads to reduction of the time to complete the task, and the problem of CVS has also been minimized (Izquierdo et al, 2004; Chiemeke et al, 2007; Divjak & Bischof, 2009). The productivity, of unaware computer users about their vision problems, is also found to be minimum. So, CVS has become one of the public health problems affecting all computer users (Torrey, 2003).

To the best of our knowledge, information on magnitude and factors affecting CVS among skilled workers in Nepal is not available. We present the prevalence and factors influencing CVS among IT office workers of Kathmandu, Nepal in 2019. On its basis recommendations are proposed to reduce CVS among the study population.

Materials and methods

A cross sectional study was conducted targeting skilled workers of 5 IT companies in Kathmandu, Nepal. The consent from the respondents was taken in the written form. Those were included who had provided approval to take part in the study. Those declined were excluded. The personal identification of the participant was delinked while analysis was done.

The sample size for this study was based on finite population size. Since the total number of workers for these companies were 697, the necessary sample size for this research work was 263 workers which were estimated considering 5% margin of error (Yamane, 1973) with 95% confidence interval. Based on the number of staff in IT institutions, the sample was further stratified using random sampling technique.

Data was collected through a self-administered questionnaire and observation by the investigators. A set of questionnaires was finalized based on the different similar types of studies carried out earlier (Reddy et al, 2013; Dessie et al, 2018). Then the finalized questionnaire, in this way, was used for this research work. Data was collected via questionnaire which is filled up with printed form as well as filled up with *KoboCollect* questionnaire form (electronic device). Altogether 277 office workers from 5 companies were randomly selected without replacement using proportionate stratified random sampling from the detailed list of respondents collected from respective human resource departments of companies. In this sampling technique, each company was treated as a stratum, and the number of samples was proportional to the population for each stratum. Then the samples were drawn from each office with simple random sampling without replacement

method with the help of random numbers using Microsoft Excel.

The major interest of this study was to identify most important factors such as types of device used, how long a worker works with the computer/VDT per day, type of eyeglasses and other factors associated with CVS. The list of those respondents selected for participation in the study which were selected in Microsoft Excel. Data was collected after explaining why this study has been planned, the research process & confidentiality of the data, with the collaboration with human resource officers or respective representative persons for each company. Informed consent from each respondent was taken for the study.

Those participants were included in the study if they were present in the data collection day. The filled up questionnaire received from the respondents were assessed whether all the sections were responded to or not. The questionnaire forms, which were not completely filled up, were excluded from the study.

A person is considered having CVS if the participant reported he/she had experienced at least one of the symptoms (eyestrain, headache, tiredness/burning sensation, dry/red eyes and shoulder/neck pain) during/following use of Visual Display Terminal(VDT) (Bali, Navin & Thakur, 2007; Dessie et al, 2018). The viewing distance from eye to the level of the computer screen is considered proper if it is 40-75 cm (*AOA,* 2019).

All the statistical analysis was performed by using SPSS 23.0 and STATA 15.1. The association of different continuous variables with the outcome variable (CVS: Yes vs. No) were assessed by using Independent t-test or Mann-Whitney U test wherever applicable. The association between categorical variables with outcome variable was assessed through Chi-square test or Fisher's exact test whichever was suitable. Those variables which have come statistically significant in bivariate analysis were considered as candidate variables for multiple logistic regression model. Stepwise forward selection approach was applied to select the variables in the final multiple logistic regression model. All the analysis was considered statistically significant if p- value < 0.05 at 5% level of significance.

Results

Of the 277 office workers complete information was obtained from 263 office workers. Among participants, 213(81%) were male and 50(19%) were females. The '20 to 30', and more than 30 years aged comprised 83% and 17% of participants.

Among participants, 217 [82.5% (95% CI: 81.3% - 83.6%)] had CVS. 142(54%) did not have previous eye disease. As many as 124(47%) participants were using spectacles, among them 113(91%) for myopia correction. Practice patterns of using bright computer screens was in 126(48%) participants.

Laptop was the most used type of computer [246 (93.5%)]. 161(61%) had reported using viewing distance (40 -75 cm) from the eye to the computer screen. 143(54%) were reported to be using computer screens at the eye level and 94(36%) for below and 26(10%) were for above eye level. 163(62%) computer users were not aware about the bad effects of computers in their eyes. The most used preventive measure reported was using preventive goggles [140(53.2%)] followed by taking breaks in between use [57(21.7%)], but 66(25.1%) persons were not using any preventive measure. The most occurred CVS symptoms were headache [127(48%)], tired eyes [123(47%)], eye strain [114(43%)], shoulder pain [84(32%)], neck pain [80(30%)] respectively.

The eyestrain [45(17.1%)], headache [38(14.5%)], tired eyes [38(14.5%] and blurred

vision [23(8.7%)] were main symptoms reported.

The computer use was 10.42 ± 2.02 hours/day (7.7 hours in office and 2.7 hours in home). The job duration was 56.52 ± 46.93 months. The video display gadgets (besides computer) used per day was 3.24 ± 2.3 hours and CVS symptoms developed after 4.75 ± 2.82 hour of computer work.

The outcome of univariate and multivariate analysis to identify risk factors and predictors of CVS is given in Table 1.

Table 1: Association of variables with CVS using bivariate and multivariate analysis

Variables	Categories	Bivariate analysis			Multiple logistic regression analysis		
		CVS		p-Value	Odds Ratio	95% CI	p- Value
		Yes	No				
		n (%)	n (%)				
Taking breaks	Yes	38 (66.67)	19 (33.33)	<0.05†	1.0	-	-
	No	179 (86.90)	27 (13.10)		7.3	(2.2, 24.9)	0.002
Massage of eyes	Yes	44 (95.65)	2 (04.34)	<0.01††	1.0	-	-
	No	173 (79.72)	44 (20.27)		7.5	(1.2, 47.7)	0.031
Total computer use (hours/ day)	≤ 10 hours	101 (73.19)	37 (26.81)	<0.01†	1.0	-	-
	> 10 hours	116 (92.80)	9 (07.20)		5.4	(1.6, 18.2)	0.006
Viewing distance (from eye to computer screen)	Proper (40-75 cm)	118 (73.30)	43 (26.70)	<0.01††	1.0	-	-
	Improper	99 (97.06)	3 (02.94)		9.0	(2.0, 44.5)	0.004
CVS awareness & its preventives	Yes	163 (63.00)	37 (37.00)	<0.01†	1.0	-	-
	No	154 (94.48)	9 (05.52)		7.2	(2.6, 20.3)	0.000
Proper body posturing	Yes	83 (74.11)	29 (25.89)	<0.01†	1.0	-	-
	No	134 (88.75)	17 (11.25)		3.6	(1.3, 10.3)	0.013
Level of computer screen	Above eye level	25 (96.15)	1 (03.85)	<0.01††	-	-	-
	At eye level	129 (90.20)	14 (09.80)		-	-	-
	Below eye level	63 (67.03)	31 (32.97)		-	-	-
Wearing power glasses	Yes	113 (91.13)	11 (08.87)	<0.01†	-	-	-
	No	104 (74.83)	35 (25.17)		-	-	-
Brightness of computer screen	Bright	112 (89.89)	14 (11.11)	<0.01†	-	-	-
	Dull	105 (76.25)	32 (23.35)		-	-	-

Use eye drops	Yes	51 (94.45)	3 (05.55)	<0.05††	-	-	-
	No	166 (79.42)	43 (20.57)		-	-	-
Use goggles as preventive measure	Yes	109 (77.86)	31 (22.14)	<0.01†	-	-	-
	No	108 (87.81)	15 (12.19)		-	-	-
Duration of wearing power glass (months)	Mean ± S.D. Median (Range)	47.35 ± 62.86 5 (274)	21.63± 50.02 0 (165)	<0.01¥	-	-	-
Total work duration (months)	Mean ± S.D. Median (Range)	59.65 ± 49.79 42 (274)	41.73 ± 25.44 36 (114)	<0.01¥	-	-	-
Total time of other VDT use (hours/ day)	Mean ± S.D	03.38 ± 02.51	02.59 ± 01.66	<0.01¥¥	-	-	-

† Chi- Square test, ††Fisher Exact test, ¥ Mann-Whitney U test, ¥¥ Independent t-test

Discussion

More than eight out of ten IT officers were suffering from CVS. This is similar to the prevalence rate reported by (Lograj, Madhupriya & Hegde, 2014), lower than (Reddy et al, 2013) and higher than (Alemayehu, 2014; Assefa & Weldemichael, 2017; Chiemeke et al, 2007; Dessie et al, 2018). The variation in CVS rate could be because of different study populations and their practice pattern compared to our study population. Nonetheless, the CVS rate among Nepalese IT workers seems to be greater than most that of other studies. This clearly demands to take necessary measures to reduce CVS rate considerably.

Longer breaks between computer works protect from CVS. This result is in a similar direction with the findings reported by other such studies (Assefa, 2017; Kozeis, 2009; Noreen, 2016; Logaraj & Madhupriya, 2014). It would be beneficial for computer workers to take frequent breaks for reducing CVS while working with computers. Our study has identified that massage of eyes and maintaining proper body posture were also helpful to protect from CVS.

The risk of developing CVS was higher who were not aware about this problem, and its protective remedies. This is similar with findings of other studies (Akinbinu & Mashalla, 2013; Chiemeke et al, 2007). In general, the awareness about CVS and the remedies to be adopted should go side by side which consequently helpful to tackle the occupational injuries and diseases.

Further, the risk of CVS increases considerably if the workers work with computers more than ten hours/day. Kozeis (2009) and Shrivastava et al (2012) also indicated that it would be helpful to prevent CVS if the computer workers work less time in front of the computer. Hence, working with a computer continuously for a longer time in a day increases the risk of CVS.

Besides them, the risk of CVS was higher among IT workers who were not maintaining proper viewing distance (40-75cm) which is similar

with the finding reported by Shantakumari et al (2014).

Our study fairly highlighted this public health issue and identified the magnitude and determinants of CVS. However, this study cannot be free from some limitations. Cross sectional study does not allow us to establish a special relationship of risk factors to the outcome. CVS was first or factor studied was first is not known. Even for having significant determinants associated with CVS, 95% confidence intervals for most of the odds ratios were very wide which might be because of not having balanced numbers in each comparative group of variables with this smaller sample size. In future, other suitable studies such as case control study may be planned in order to establish the causal relations with CVS taking sufficiently larger sample size.

Conclusion

This study concludes that computer vision syndrome is a highly frequent condition among IT office workers. There is a need to create awareness for the IT officers about the negative consequences of CVS and the most promising factors associated with it. In order to minimize and prevent CVS, it is recommended for IT workers to be aware about the harmful effects on eyes because of using computers/VDT/ mobiles for longer time consistently, and not to use such devices more than ten hours in a day. If one is interested to use such devices many hours in a day, then protective measures such as taking breaks and massage of eyes must be applied continuously, workers should use proper viewing distance (40 - 75 cm) as well as proper/comfortable body posturing while using the computer.

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