Computer User: Demographic and Computer Related Factors that Predispose User to Get Computer Vision Syndrome

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Abstract

Introduction: *Computer vision syndrome (CVS) is an eyes and vision problems related to the activities that experienced in relation/during the use of computer. This study aims to identify sociodemographic and computer related predictors for CVS.* ***Methods:*** *Cross-sectional study and face-to-face interviews and workstation assessment were employed guided by questionnaire.* ***Results:*** *Finding showed that 68.1% reported CVS symptoms. Only 19.3% of the respondents put their computer on computer table and 61.9% took at least 10 minutes rest while on continuous one hour computer work. Multivariate logistic regression analysis revealed that the predictors for CVS were Female (OR=2.3), age <27 years old (OR=2.89), use correction spectacle/lenses (OR=1.91), not taking regular rest (OR=1.78) and use computer > 7 hours per day (OR=2.01).* ***Conclusion:*** *Use of correction lenses and long duration on continuous computer work predispose a person to get CVS. Resting their eyes in between continuous computer work will be helpful to reduce possibility to get CVS.*

Keywords: vision syndrome, computer, eye strain, ocular symptoms

1. Introduction

Malaysia is a developing country that fast reaching developed country status. Hence, Malaysian government encouraged use of information technology to all the citizens. This encouragement has created modern workplaces with computer being the main working tools. The scenario can be seen in almost all office setting with a personal computer been an important tool for many workers in Malaysia today. A rapid increase in the use of advanced technology in the workplace has raised concern for the health and well-being of the computer users. It is known that computer may predispose the users to health problems. Many individuals who work with computers reported high level of job-related complaints and symptoms including ocular discomfort (American Optometric Association, 2011). Long duration of computer usage has leads to occupational risk of developing "health syndrome" which related to computer including Occupational Overuse Syndrome (OOS), Computer Vision Syndrome (CVS), upper limbs symptoms, back pain and psychosocial stress (Richardson and Sen, 2007, Zairina and Atiya, 2009). Computer Vision Syndrome has been reported as one of the most common complaint among computer users who used computer monitor (Singh and Wadha, 2006, Alexis and Gregory, 1997).

Although many studies reported association between computer usage and health problems, most of these studies focused on other parts of body symptoms and the most common one is musculoskeletal (Zairina and Atiya, 2009). Very few published studies were conducted in Malaysia on computer related eye problems and one of it was done by Richardson and Sen (2007) that reported ocular symptoms among university students. Computer vision syndrome (CVS) as the outcome of interest in this study has been defined by the American Optometric Association (AOA) as a complex of eye and vision problems related to the activities which stress the near vision and experienced in relation, or during the use of the computer (American Optometric Association 2010, Loh and Reddy, 2008). In view of limited published documents pertaining to CVS, this study aims to identify the prevalence of CVS among the Malaysian respondents and the predictors for CVS to support future prevention and education program.

2. Methods

2.1 Study design and population

The study location was at one of a relatively new public higher learning institution that situated at the central of Peninsular Malaysia. The university was developed merely about 10 years ago. An information technology is the main features in the university administrative setting and teaching program. Almost all staff was provided with personal computer either desktop or laptop and some of the staff used both type of computers. The study population was all university staff (academic and administrative). Only Malaysian citizenship and staff who had worked in the institution for more than one year duration were included. A cross-sectional study design was utilized to get the required information. Ethical clearance was obtained from University Higher management Board.

2.2 Research tool

An iterative process of questionnaire development and refinement including pilot-tested of questionnaire was used and a final questionnaire developed. Questions on symptoms were adapted from American Optometric Association (2010), American Optometric Association (2011) and Loh and Reddy (2008). The questionnaire was designed in English language. Questions on personal data explored about age, gender, race, educational status, type of job and use of correction spectacle/lenses. The information collected for computer usage were on availability of computer table (whether computer was placed on the designated computer table), regular rest during computer work (at least 10 minutes rest for every hour of continuous computer work) and duration of computer usage per day at work (average time in hours per day) (Alexis and Gregory, 1997).

2.3 Sampling methods and data collection

The list of study subjects was obtained from Human Resources department. The inclusion criterion was academic and administrative staff that used computer at work for at least two (2) hours per day (Zairina and Atiya, 2009). Study subjects with non-Malaysian citizenship were excluded from this study as an anticipation of language barrier. OpenEpi version 2.3 was used to calculate the sample size. With confidence level of 95%, anticipated frequency of 50% and additional of another 40% samples, the required sample size was 540. Data collections were conducted by interviewers who were trained about the research tools and data collection technique to reduce interviewer bias. Written consents were obtained from all study subjects that fulfil inclusion criteria prior to the interview. Involvement in this study is optional and in voluntary basis. After consented, each study subject was interviewed in face-to-face guided by a set of questionnaire to get information on personal and computer information. Their workstation was assessed for verification of information pertaining to location of computer and computer table.

2.4 Variables and analyses

All data were coded accordingly and entered into Statistical Package for Social Science (SPSS) application version 17.0. The descriptive data were presented as percentages, mean with standard deviation (SD) or median with inter quartile range (IQR). Dependant variable in this study was computer vision syndrome (CVS) and defined as study subjects who reported any eye symptoms while on continuous computer work at workplace within the past one month duration. The eye symptoms were watering eyes, painful eyes without any eye pathology, burning sensation of eyes, blurring of vision, double vision, dryness and sore eyes (Alexis and Gregory 1997). CVS was coded as "no CVS=0" and "CVS=1". The chi-square test of significance was used for analyses of categorical variables. Multivariate logistic regression analysis was used to adjust for confounding effect and determine study variables that will significantly predict respondents to get CVS. The study variables were gender (0=male, 1=female), age groups in quartiles years (0=more than 33, 1=less than 27, 2=27–29.9, 3=30–33), educational level (0=tertiary level education, 1=secondary level education), type of job (0=academician, 1=administrative), use correction spectacle/lenses (0=no, 1=yes), computer table (0=yes, 1=no), regular rest (0=yes, 1=no) and duration of computer usage at work in quartiles of hours per day (0=less than 5 hours, 1=5–5.9 hours, 2=6–7 hours and 3= more than 7 hours). A block entry method was chosen for the analysis and *p*-value of < 0.05 was considered to be significant.

3. Results

3.1 Response rate

A total of 436 respondents voluntarily involved in this study, thus given the response rate about 80.7%.
Prevalence of CVS as reported by respondents in our study was 68.1% (297).

3.2 Descriptive of personal data (Table 1)

Female constituted about 61.5% (268) of the respondents. The majority of respondents aged between 27–29.9 years old with percentages of 30.7% (134) and the mean age of 31.5 years (SD=7.3). Age was ranging from 21 to 62 years old. Administrative staffs were the majority involved in this study with 75.7% (330) and only 24.3% (106) were academician. In term of education, majority of the respondents 74.7% (325) attained up to the secondary level of education. Respondents who used correction spectacle/lenses were 48.2% (210).

3.3 Descriptive of computer usage data (Table 1)

Only 19.3% (84) of the respondents put their computer on computer table whilst another 80.7% (352) placed their computer on their working table. Only 61.9% (270) of the respondents took regular rest while on continuous one hour computer work. The median for duration of rest was 10.0 (IQR=10.0). Duration of computer usage in quartiles showed that majority of the respondents used computer less than 5 hours per day with percentage of about 42.9% (263). Mean duration of computer usage was 5.9 (SD=1.82).

3.4 Analyses of categorical variables (Table 2)

Chi-square test showed significant differences between respondents with CVS and no CVS with respect to gender, age group, use of correction spectacle/lenses and duration of computer usage per day at work.

3.5 Multivariate logistic regression analyses (Table 3)

Unadjusted odds ratio (OR) showed that female were significantly having 2.69 higher odds for CVS compared to male. Among four age groups only respondents with aged less than 27 years old were significantly having 2.45 higher odds when compared to age group of more than 33 years old. The rest of the age groups were not significant even though the odds were also higher than the comparison group. Respondents who used correction spectacle/lenses were significantly having 1.89 higher odds than those not on correction spectacle/lenses. Respondents who did not take rest while on continuous one hour of computer work were significantly having 1.94 higher odds compared to those taking rest. Respondents with long hours of computer usage were significantly having higher odds compared to respondents who spent less than 5 hours per day on computer. To predict the occurrence of CVS, multivariate logistic regression analysis combined all the predictors in a model to adjust for potential confounders. Female persisted as a strong predictor for CVS with odds ratio of 2.3 compared to male. Age group of less than 27 years old was the only significant predictors for CVS with odds ratio of 2.89 compared to those aged more than 33 years old. Use of correction spectacle/lenses (odds ratio of 1.91) and not taking task break while on continuous one hour computer work (odds ratio of 1.78) also persisted as strong predictors for CVS. Spent time for more than 7 hours per day on computer at work was a significant predictor for CVS (odds ratio of 2.01). Other computer durations did not endure its significance in multivariate model. Educational status, type of job and placing computer at designated computer table were not significant predictors for CVS.

4. Discussion

Computer Vision Syndrome (CVS) is a common health problem that associated with computer (American Optometric Association, 2011). It was commonly suffered by majority of the computer users but rarely bring them to see doctors as the sign and symptoms may not be too burdening to them. Previous studies of visual symptoms amongst computer users have shown variations in prevalence that reflected difference in research methodology, which caused difficulty in comparing the results between studies. Our study found that two in every three respondents (68.1%) had computer vision syndrome (CVS). When comparing this prevalence with other study, the prevalence in our study was higher compared to survey done in Mauritius whereby some of their respondents were also university staff. They reported only 59.5% prevalence of CVS (Subratty and Korumtolee, 2005).

There were few other studies that reported higher prevalence compared to our study. The prevalence of 68.1% in our study was slightly low compared to prevalence reported by Iwakiri et al (2004) who found 72.1% of office workers in their self reported survey were having eye strain and/or pain. Another study (Richardson and Sen, 2007) reported even higher prevalence of various eye symptoms among their respondents (laid between 46 to 87 percents). Comparison of our finding with previous study should be done with cautions as our study lump together all the reported symptoms to meet with our definition for CVS whereas previous study (Richardson and Sen, 2007) reported prevalence of each eye symptom separately and no specific on duration of symptons.

Other main difference of our study compared to previous studies (Iwakiri et al, 2004, Richardson and Sen, 2007) that might contribute to lower in prevalence is that we interviewed our respondents in face-to-face method to have better assess for clarification of symptoms but previous studies used self administered questionnaire to elicit eyes symptoms. Our respondents were relatively young aged with mean aged of 31.5 years. This scenario can be understood because the university was established only about 10 years ago and employed majority of younger age staff. An interesting finding was revealed in our study that younger age group had higher odds for CVS compared to older age group. Age group of less than 27 years old was a significant predictor for CVS although the other age groups were not. When analysed further, a negative correlation was found between age of the respondents and duration of computer usage at work with Pearson Correlation value of -0.213 and *p* value <0.001. It indicated that younger age group used computer in longer duration that the older age groups. This scenario may explain the higher odds among younger age group.

With regards to gender distribution, our study revealed that female constituted around 60% of the respondents. This concurred with distribution of other studies that found majority of their respondents were also female (Richardson and Sen, 2007, Zairina and Atiya, 2009). Gender was significantly associated with CVS and univariate analysis showed that female had 2.69 (95%CI: 1.78, 4.07) higher odds for CVS compared to male respondents. Logistic regression analysis strengthens this finding and revealed that gender was a significant predictor for CVS when other factors in the model were constant with odds of 2.3 (95% CI: 1.45, 3.65). Our finding was in agreement with previously reported finding that computer vision syndrome were more prevalence among women (Subratty and Korumtolee, 2005, Iwakiri et al, 2004, Jakson et al, 1997, Green and Briggs 1990). This could be explained by the fact that office works nowadays that mostly require computer were dominated by women gender (Zairina and Atiya, 2009, Green and Briggs, 1990).

Computer users who suffer binocular problems may not develop any eye symptoms if they do less strenuous visual task. However, computer work commonly needs strenuous visual activity and this can cause eye symptoms especially among those using spectacles/lenses. It was mentioned that miscorrected or uncorrected vision problems may be an important cause of eyestrain (Loh and Reddy, 2008). Our study has revealed that used of correction spectacle/lenses were significantly associated with CVS. Even after adjustment of other variables, this factor remained as a strong significant predictor for CVS with odds ratio of 1.91 (95% CI: 1.22, 3.01). Jackson et al (1997) highlighted that wearing multifocal and bifocal correction lenses were significantly associated with eye problems. Potential explanation of increase odds of CVS among those using correction spectacle/lenses is because computer tasks is a type of near work that looks at letters on the screen which are formed by tiny dots called pixels, rather than a solid image. This causes the eyes which already have some corrective problem to work a bit harder to keep the images in focus (American Optometric Association, 2011).

Task break during continuous computer work is important to reduce eye strain as changing eye focus from computer screen can relax the eye muscles (Alexis and Gregory, 1997). Taking rest (at least ten (10) minutes during continuous one hour computer works) was significantly associated with CVS in our study and it was a significant predictor for CVS when other factors were controlled with increase of odds ratio to 1.78 (95% CI:1.11,2.87) among respondents who did not take break. However we did not record the frequency or intervals of rest breaks taken by respondents within one hour of continuous computer work. Only the total length of breaks per hour of continuous computer work was recorded. Our finding contradicted Collins et al (1990) who reported that length of time spent on work breaks did not significantly influence visual symptoms. Our finding also different from Balci and Aghazadeh (2003) who concluded that 10 minutes rest of every hour work schedule was associated with higher eye symptoms. They proposed that computer users should take 5 minutes rest for every 30 minutes work schedule or four times rest per hour of work to lessen eye symptoms. Few studies reported significant association of long hours of working with computer and adverse health effect (Zairina and Atiya, 2009, Subratty and Korumtolee, 2005, Jackson et al, 1997). Our respondents generally used computer more than half of their working hours of 8 hours per day (mean = 5.9 hours). In our study, hours of computer usage per day were significantly associated with CVS and increasing odds ratio were seen with the increasing time spent with computer. Working with computer for more than 7 hours per day was predisposing a person to get CVS.

5. Conclusion/Recommendations

Computer Vision Syndrome is a common ocular problem but the symptoms often been ignored and neglected by the computer users. If the problem persisted it may reduce job satisfaction and performance.

Prevention of symptoms is an important strategy and computer users need to understand factors that may contribute to this symptom. Computer users should reduce their time spend working on computer to less than 7 hours per day. Those with correction spectacles/lenses should pay more attention for the possibility of getting this symptoms and taking task break to rest their eyes in between continuous computer work will be helpful.

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Table 1. Descriptive of personal and computer usage data of the respondents

Variables	N	%	
Gender			
Male	168	38.5	
Female	268	61.5	
Age group (years) quartiles			
Less than 27	82	18.8	Mean = 31.5
27 – 29.9	134	30.7	SD = 7.3
30 – 33	95	21.8	
More than 33	125	28.7	
Educational status			
Secondary level education	110	25.3	
Tertiary level education	325	74.7	
Type of job			
Academician	106	24.3	
Administrative	330	75.7	
Use correction spectacle/lenses			
No	226	51.8	
Yes	210	48.2	
Computer on computer table			
Yes	84	19.3	
No	352	80.7	
Regular rest			
Yes	270	61.9	Median = 10.0
No	166	38.1	IQR = 10.0
Duration of computer usage (hours per day) in quartiles			
Less than 5	187	42.9	Mean = 5.9
5 - 6	81	18.6	SD = 1.82
6 – 7	82	18.8	
More than 7	86	19.7	

Table 2. Analyses of categorical variables

Variables	No CVS		CVS		Total		*p*-value
	N	%	N	%	N	%	
	139	(31.9)	297	(68.1)	436	(100.0)	
Gender							
Male	76	(54.7)	92	(31.0)	168	(38.5)	<0.001*
Female	63	(45.3)	205	(69.0)	268	(61.5)	
Age groups (years) quartiles							
Less than 27	18	(12.9)	64	(21.5)	82	(18.8)	0.036*
27 – 29.9	40	(28.8)	94	(31.6)	134	(30.7)	
30 – 33	30	(21.6)	65	(21.9)	95	(21.8)	
More than 33	51	(36.7)	74	(24.9)	125	(28.7)	
Educational status							
Secondary level education	35	(25.4)	75	(25.3)	110	(25.3)	0.980
Tertiary level education	103	(74.9)	222	(74.7)	325	(74.7)	
Type of job							
Academician	41	(29.5)	65	(21.9)	106	(24.3)	0.084
Administrative	98	(70.5)	232	(78.1)	330	(75.7)	
Use correction spectacle/lenses							
No	86	(61.9)	137	(46.1)	223	(51.1)	0.002*
Yes	53	(38.1)	160	(53.9)	213	(48.9)	
Computer on computer table							
Yes	23	(16.5)	61	(20.5)	84	(19.3)	0.325
No	116	(83.5)	236	(79.5)	352	(80.7)	
Regular rest							
Yes	82	(59.0)	188	(63.3)	270	(61.9)	0.388
No	57	(41.0)	109	(36.7)	166	(38.1)	
Duration of computer usage (hours per day) in quartiles							
Less than 5	79	(56.8)	108	(36.4)	187	(42.9)	<0.001*
5 - 6	23	(16.5)	58	(19.5)	81	(18.6)	
6 – 7	23	(16.5)	59	(19.9)	82	(18.8)	
More than 7	14	(10.1)	72	(24.2)	86	(19.7)	

Note: * is a significant variable

Table 3. Logistic regression predicting computer vision syndrome (CVS)

Variables	Unadjusted OR (95% CI)	Logistic regression		
		B	Adjusted OR (95% CI)	*p*-value
Gender				
Male [a]	1.00			
Female	2.69 (1.78,4.07)*	0.835	2.30 (1.45,3.65)	<0.001*
Age groups (years) quartiles				
Less than 27	2.45 (1.30,4.62)*	1.060	2.89 (1.38,6.04)	0.005*
27 – 29.9	1.62 (0.96,2.71)	0.565	1.76 (0.98,3.16)	0.059
30 – 33	1.49 (0.85,2.62)	0.344	1.41 (0.76,2.63)	0.278
More than 33 [a]	1.00			
Educational status				
Secondary level education [a]	1.00			
Tertiary level education	1.01 (0.63,1.60)	0.183	1.20 (0.72,2.01)	0.488
Type of job				
Academician [a]	1.00			
Administrative	1.49 (0.94,2.35)	0.007	1.07 (0.62,1.87)	0.804
Use correction spectacle/lenses				
No [a]	1.00			
Yes	1.89 (1.26,2.86)*	0.649	1.91 (1.22,3.01)	0.005*
Computer on computer table				
Yes [a]	1.00			
No	0.77 (0.45,1.30)	-0.223	0.80 (0.45,1.42)	0.446
Regular rest				
Yes [a]	1.00			
No	1.94 (1.25,3.00)*	0.578	1.78 (1.11,2.87)	0.018*
Duration of computer usage (hours per day) in quartiles				
Less than 5 [a]	1.00			
5 - 6	1.85(1.05,3.24) *	0.223	1.25 (0.68,2.30)	0.475
6 – 7	1.88(1.07,3.29)*	0.151	1.16 (0.61,2.20)	0.644
More than 7	3.76 (1.98,7.15)*	0.697	2.01 (0.99,4.04)	0.051*

Note: [a] is a reference group
Note: * is a significant variable.