

Computer Vision Syndrome: A Rising Occupation Hazard

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Abstract

Background: Computers are necessity of 21st century however, became associated with occupation hazard in our setup due to visual, extra-visual, musculoskeletal and various other health related problems arising from their prolonged use.

Objective: To know the frequency of various health related problems among computer users by observing their workstation practices.

Study design, settings and duration: It was descriptive cross sectional study conducted in different ministries under Pakistan Secretariat Islamabad from November 2013 to February 2014.

Subjects and Methods: The information was taken by face to face interviews and convenient sampling technique was used to select individuals using computers for working in different ministries under Pakistan Secretariat, Islamabad. Federal government employees using computers were inspected in their offices and self-administered questionnaire was used to record all related information. Data collected by a trained interviewer while their workstation practices were evaluated by face to face interviews by applying OSHA VDT checklist. SPSS version 17 was used and data analyzed for frequencies/percentages.

Results: Four hundred volunteers, age ranging 26-55 years with mean age 40.35 years \pm 10.78 participated/ screened in this study for computer vision syndrome (CVS). One eighty eight 188 (47%) subjects had visual problems. The most common complaint 73 (39%) was burning of eyes and this symptom was found mostly among 46-55 years group. Among extra visual problems, neck pain was commonest in 67% mostly in female of 36-45 years age group. OSHA VDT checklist scoring showed that 77% workstations were poorly designed. Sixty one percent subjects were not aware of ergonomics, 57% complained of noisy environment and 63.5% were dissatisfied with their workplaces.

Conclusion: Subjects with longer duration of their service and computer usage showed increased percentages of eye strain in our study.

Key words: computer vision syndrome (CVS), prevalence, ocular complaints, OSHA VDT checklist, extra ocular symptoms.

Introduction

Computers have become a necessity of 21st century. All government offices, universities

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Authors Contribution

MAB conceptualized the project. Data collection & Literature search was done by MAB & RM. WM performed the statistical analysis. MAB also did the drafting, revision and writing of manuscript.

and homes are using computers regularly.¹ CVS relates to eye problems after prolonged computer use. Factors like ergonomics, position of screen, glare, temperature, workstations and visual defects influence CVS.² Ergonomics is a Greek words, "ergon," work, and "nomoi," means natural laws. It denotes study of people at work. Ergonomics knowledge helps to reduce the impact of prolonged sitting on a computer and relieving CVS.³

Computer vision syndrome is categorized as i) asthenopic –eye strain, blurred vision (ii) ocular surface related- dry eye and (iii) extra ocular – neck/ shoulder pain, back ache. All computer workers at their job are using a workstation.⁴ Sixty eight percent of Americans have smart phones and 45% have tablet computers according to US Technology Device Ownership, October 2015.⁵ Both National

Institute for Occupational Safety and Health (NIOSH) and WHO defined the work related musculoskeletal disorders as multifactorial due to poor workstations.

CVS is like carpal tunnel syndrome and other motion injuries during work.⁶ Reading a printed page is different from seeing the screen.⁷ The letters on the computer screen are bright at the center and dim at their edges. The level of contrast is reduced due to glare.⁸ Musculoskeletal disorders related to work are main occupational hazards, the prevalence ranging from 63-94%.⁹

OSHA VDT checklist helps to create a comfortable workstation. A “yes” response shows good ergonomic design conditions. A “no” response manifests an ergonomic risk factor which requires further improvement.¹⁰

Over use of technology has led to CVS in Asia but one study in Pakistan, mentioned that 75% of computer users have some form of CVS.¹¹

Keeping in mind the findings of this study, it seems that CVS in Pakistan is on the rise and is a public health problem reducing work productivity. Therefore, the current study was planned to know the frequency of CVS and status of workplaces in public sector of Islamabad.

Subjects and Methods

Four hundred willing Federal government employees working in various ministries under Pakistan Secretariat Islamabad along with the staff of Federal Government Services Hospital Islamabad (clinicians/ nurses/ academician) were inspected in their offices while their workstation assessment was done by Occupation Safety and Hospital Administration Video Display Terminal Checklist (OSHA VDT Workstation checklist) developed by the Cornell University Ergonomics, United States Department of Labor.

The Office Superintendents of various ministries were contacted and information about serving individuals were collected. Subjects more than five years of service and working with computers for minimum of three hours per day were enrolled and inspected during working hours. Subjects with best corrected vision less than 6/12, contact lens users, strabismus and any ocular pathology were excluded from the study.

Related data e.g. socio-demographic data, CVS symptoms, details of computer usage, job satisfaction, current workstations and knowledge on ergonomics practices and their service record was collected from all enrolled participants using research questionnaire by a trained interviewer. Participant’s knowledge about workplace and proper

posture was assessed by 10 pictorial questions giving one mark to one correct answer having total score of 10. The visual and musculoskeletal disorders were defined as the pain present during last twelve months, lasting for one month and affecting work productivity in one of these regions, eyes, neck, forearm, wrist and back.

Data was collected and SPSS 17 was used to analyze the frequencies/percentages. Significant *p* value was <0.05. Presence of CVS was taken as dependent variable.

Results

Four hundred volunteers (response rate (88.8%) participated in this study. Male were 250 (62.5%) and female 150 (37.50%). Age ranged from 26-55 years with mean age 40.35±10.78 years. Among participants, 140 were data operators, 63 accountants, 41 planners, 32 academicians, 80 teachers, 21 laboratory technicians, 23 receptionist and administration staff.

One hundred eighty eight (47%) participants had asthenopic symptoms with break down of female 108 (57.4%) and male 80 (42.6%). Of asthenopic symptoms, 73 (39%) had sensitive eyes, 62 (33%) had itching and 54 (29%) were having red eyes. Visual problems were common in both genders and were more common in 46-55 years group indicating relation to longer duration of their services. Among extra visual problems, neck pain was commonest in 67%, backache in 61% while 32% were having leg pain. These complaints were more common in females of 36-45 years age group and who worked 4-6 hours/day. Physically fit men had lower frequency than others while physically fit women showed the same frequency compared to others.

Table 1: Baseline characteristics of the study participants.

Age wise	Total n (%)	Male n (%)	Female n (%)
26-35yrs	102 (25.5)	61 (59.8)	41(40.2)
36-45yrs	154 (38.5)	96 (62.3)	58(37.6)
46-55yrs	144 (36)	93 (64.6)	51(35.4)
<i>Number of working years</i>			
4-7yrs	178 (44.5)	101 (56.7)	77(43.3)
8-10yrs	222 (55.5)	133 (59.9)	89(40.1)
<i>Number of working hours with computer/day</i>			
1-3 hrs	215(53.75)	122(56.7)	93(43.3)
4-6 hrs	185(46.25)	81 (43.7)	104(56.3)
CVS	178(61)	100(56)	78(44)
Smokers	57(22.8)	57(22.8)	-

Regarding status of workplaces, 73% workstations in our study were poorly designed as

Table 2: Workstations assessment according to OSHA VDT Checklist.

<i>About Employee</i>	Yes	Male	Female	No	Male	Female
	N (%)			N (%)		
Head/neck upright, face forward/not twisted	198 (49.5)	127	71	202 (50.5)	144	58
Upper arm/elbow close to body (not extended)	234 (58.5)	190	44	166 (41.5)	122	44
Forearms, wrist, hands, thighs parallel to floor	176 (44)	102	74	224 (56)	186	38
<i>About Chair</i>						
backrest/cushion supports lower back	192 (48)	132	60	208 (52)	138	70
Seat width, depth (not too big/small)	182 (45.5)	134	48	218 (54.5)	190	28
Armrest supports forearm	222 (55.5)	152	70	188 (47)	110	78
<i>About Monitor</i>						
Screen distance/can read without bending	152 (38)	102	50	248 (62)	202	46
Screen top line at/below eye level, No glare from window	182 (45.5)	100	82	218 (54.5)	175	43
<i>About Work Area</i>						
Employee close to keyboard/input device	200 (50)	126	74	200 (50)	120	80
Thighs/legs have clearance space under table	177 (44.2)	114	63	223 (55.7)	190	33
<i>About Accessories</i>						
Telephone position on table (not bent position)	192 (48)	126	66	208 (52)	188	20
Document holder (large/at level with monitor)	42 (10.5)	32	10	358 (89.5)	212	146
<i>General</i>						
Employee has safe working position to perform	128 (32)	100	28	272 (68)	210	62
Workstation/equipment function properly	140 (35)	107	33	260 (65)	190	70

*A "yes" response shows good ergonomic design. A "no" response is an ergonomic risk factor which requires improvement.

per indicators of OSHA VDT checklist where CVS symptoms were high than those with well designed workstations. About 57% complained about a noisy environment, 34% this complaint was done by women. Sixty one (61%) study participants were not aware of ergonomics. 63.5% were dissatisfied over their workstation, 40% being males. Employees who used the computer <20 inches distance, moved upwards or downwards to see the screen, did not use adjustable tables and keyboards and who did not avoid glare developed CVS more. Participants practicing ergonomic principles and checking their posture were safe and had managed CVS.

Discussion

Computers, tablets and mobile phones are used regularly worldwide. By staring at the screen, blinking rate is reduced from 15/minute to 5/min. leading to CVS.¹²

In this study a greater proportion of subjects 215 (53.75%) reported less than 4 hours of computer use per day. Out of those, 46.3% did not experience any symptoms of CVS and 41.2% reported only one symptom. Those 185 (46.25%) subjects using computers for more than 4 hours daily, 30.3% reported over three symptoms, both visual and musculoskeletal, more than others. Reddy et al⁷, Logaraj et al¹³ also reported increasing symptoms of CVS with increased hours of computer use.

In the present study, 47% subjects; female 108 (57.4%) and male 80 (42.6%) had asthenopic symptoms like eye strain, eye fatigue, burning and discomfort due to unorganized workplace.¹⁴ Eyestrain could be due to long hours of computer

use, user-to-monitor distance, computers facing windows, glare and poor lighting.¹⁵

In this study 11% used antiglare screen while others were not using the same complaining more eye strain similar to the findings of study conducted by Cheng et al., who showed benefit from using blue filter.¹⁶

Our study found that 38% of participants who used the computers at prescribed distance were free of CVS symptoms while 248 (62%) were not using the same distance which were prone to get CVS. This is in line with findings of Reddy et al, 2013).⁷

Proper lighting of the room is important. 54.5% of our participants had poor lighting over their heads. Those who had lighting above their workstation showed lesser symptoms as compared to those who worked in poor lighting, this finding was similar to findings of Bababekova Y et al.¹⁷

Musculoskeletal disorders at work are main occupational hazards, the prevalence ranging from 63-94%.⁹ One study mentioned that three body regions were mostly involved in WMSD¹⁸ is similar to our results. Subjects had 67% neck, 61% back and 32% leg pain with female predominance of 59%. In this study WMSD were more frequent in younger females 59%, compared to males 41%, which is contrary to other study showing high prevalence with increasing age.¹⁹ Globally the number of people suffering from WMSD is increasing during last decade.²⁰ The signs and symptoms of WMSD result from repeated micro traumas to muscles, joints, bones, tendons, nerves and blood vessels.²¹ Research showed that musculoskeletal injuries in an office environment can be reduced/prevented by the knowledge of

ergonomics and workstation design.²² also obvious by findings of our study.

Other study showed that both ocular and work related musculoskeletal (WMSD) problems of CVS were indicator of deficient ergonomics in the workstation design.¹³ This study showed the similar results.

Reduction in CVS symptoms was observed in 45.5% subjects using the computer screen below eye level than those using above the level of eye.⁷ Our study, on the contrary, did not show any reduction of symptoms with level of computer screen use.

Some employees (57%) in our study complained about a noisy environment. Sixty one percent subjects were not aware of ergonomics and awareness was associated with gender (male vs. female: 39% vs.17.9%) In this study unorganized workstations give rise to musculoskeletal disorders. The results are similar to other.²³

Poor workstation design led to fatigued, frustrated workers leading to non productive workers.²⁴ In this study, 40% male, were dissatisfied over their workstation.

One interesting fact in this study was that male physically fit workers were better protected from MSDs than women.²⁵

CVS was more frequent among those, who had longer duration of service and computer usage, having poor ergonomics knowledge and had ill designed workstations.

Properly designed workstations and proper eye care can enhance the work productivity in public offices.

Conflict of interest: None declared.

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