Assessment of Computer Vision Syndrome in University Students in Peshawar; A Descriptive Cross-Sectional Study

Khushal Nadir Hadi, Muhammad Hamza Rehman, Hamza Khan Toru, Abdullah Ahmad Orakzai, Saifullah Khalid, Bushra Iftikhar

Khyber Medical College/Teaching Hospital Peshawar-Pakistan.

BACKGROUND: An ever-increasing exposure to screen has led to increased prevalence of computer vision syndrome in university students. OBJECTIVE: To investigate the frequency of screen usage amongst university students and to assess the impact of the hours of screen usage on the symptomatology of Computer Vision Syndrome (CVS). METHODOLOGY: A descriptive cross-sectional study was carried out amongst various university campuses in Peshawar over the period of January 2017 to April 2017. Non-probability (Convenience) sampling was done by using a pre-prepared questionnaire, which was distributed amongst university students of all study years with ages ranging from 17 to 24. Subjects with known history of diabetes, anemia, hypertension, central or peripheral nerve diseases, congenital vision disorders and those using medications such as eye drops were excluded. Data was presented in the form of percentages, frequency and tables using the SPSS v22 Software. RESULTS: Amongst the 385 respondents surveyed, the three most common symptoms of CVS that were seen in them were tired eyes at 71.8%, neck/back pain at 70.1% and headache at 42.3%. Relationships were investigated between these three most common symptoms, and the amount of computer screen usage amongst the sample population. Significant (p<0.05) associations were seen amongst university students having the symptoms of CVS and using computers for long hours. A few discrepancies also existed possibly due to small sample size. CONCLUSION: Computer Vision Syndrome (CVS) is a common phenomenon amongst university students. The symptoms of CVS show significant associations with hours of screen usage. Further studies are required in Pakistan specially to find out all the exact factors that can cause CVS-like symptoms.

INTRODUCTION

Technology has made an impact in almost every aspect of our lives. The advent of computers in the early 20th century revolutionized the world in ways no one had anticipated. As the years progressed so did the everyday use of computers. They were not only limited to office spaces but took over many professional (including medical facilities, banking, accounting, scientific research, data analysis and management, designing etc.), and personal (daily use) fields. This advent demanded the educational sector to also step up and incorporate this technology to further enhance and spread information and knowledge.

Computer use amongst students includes the use of important tools for office productivity like MS Office, Google Docs, emailing and the internet. Smart phone use and university going students have become synonymous. A study conducted in the US in 2015 [1] revealed that nine in ten university going students used laptops or notebook computers for their school work every week. 64% of these students were amongst those that used a smartphone, 40% of these students used tablets, and hybrids were used by 14% percent of the students.

Prolonged screen use can also cause problems, such as (i) dryness of eyes, (ii) redness, (iii) eyestrain, (iv) irritation, (v) tired eyes, (vi) blurred vision, (vii) hypersensitivity to light, (viii) headaches, and muscular problems, specifically (ix) back, shoulder and neck pain that stem from using a computer. All these symptoms together are called "Computer Vision Syndrome" (CVS), also referred to as Digital eyestrain by the American Optometric Association.[2] Computer Vision Syndrome (CVS) is the general term used to describe a variety of vision related symptoms that may be aggravated by *regular* use of a computer or any display screen device for *protracted*, *uninterrupted* periods of time.[3]

The Prevalence of CVS ranges from 64% to 90% among people who use computers.[4] Globally it approximately affects sixty million people. In the United States of America about 54 million children are using computers, 25-30% of whom have developed eye-related problems and must rely on glasses for better vision and computer use.[5]

It is important to carry out this study in university students because almost all their studying and other educational activities are carried out on digital devices. Moreover, the breaks that they take from their studying also involves them surfing the internet, playing video games, watching movies on these same devices, exposing themselves to even more to the negative effects all this use comes with. There have been numerous studies to show correlation between continued use of Visual Display Terminals (that includes computers,

smartphones, laptops, tablets, e-readers) and abnormal postures, musculoskeletal discomfort and visual abnormalities; most of them have been carried out on the European or Western population. Therefore, there is no relevant literature on the physical effects of computer or visual display terminal use amongst Pakistani users (especially in university-going students).

Furthermore, another reason why this research needs to be carried out is that most of the studies have been carried out on the Western World and its population since that is where technology made its first stride. There are little to no studies carried out on East Asian population because technology reached this part of the world later, specifically Pakistan. There needs to be statistical proof of the side effects so that people attain a better awareness of how to decrease their severity.

METHODS

A cross-sectional study was conducted of university students regardless of year of study, with age groups ranging from 17 to 24 years, from 1st January 2017 to 31st April 2017. All these universities were located within Peshawar. Non-probability sampling was done, and as the number of people with computer vision syndrome (CVS) amongst the population was unknown, it was assumed to be 50%, with a sample size set at 385 with 95% Confidence Intervals and (+/-) 5% precision, using an online sample size calculator.[6]

Data was collected using a self-administered questionnaire, modified from an existing research questionnaire from Iqbal et al. 2017.[7] Copies of the study's questionnaire were distributed to university students after obtaining their consent to participate willingly in the survey. To minimize the loss of sample size, teams of students from the research group attempted to visit 2 to 3 universities simultaneously during a time frame of two hours daily over the course of two months. The purpose of the study was explained clearly to all the participants, and the participants were encouraged to answer the questionnaire at their own leisure. The questionnaire took approximately 5 to 10 minutes to complete, and data collection was stopped after 385 cases were completed at around 50 students per university.

Subjects were selected based on physical presence at the time of the researchers' arrival at the educational institutions where the respondents studied. Students possessing functioning eyes whether using corrective lenses or not were included. Since medical and engineering university students have a culture of studying from laptops/tablets/phones on an almost daily basis, they were included as the main subjects amongst university students.

Subjects with a known history of anemia, diabetes mellitus, arterial hypertension, central or peripheral nerve diseases, congenital hearing and vision disorders, those using medications such as eye drops etc., and computer professionals were excluded from the study.

The study collected information about demographics, the average amount of screen exposure in hours per day, and data regarding

the symptoms of computer vision syndrome felt by the respondents including these specific 11 symptoms; headache, dry eyes, tired eyes, irritated or sore eyes, double vision, excessive tearing, squinting helping while looking at the screen, distance vision becoming blurry after screen use, dark circles under eyes, neck and/or back pain.

Data analysis was carried out using the Google Docs inbuilt form function and the Statistical Package for Social Sciences (SPSS) software. Based on the data entered into the SPSS software, frequency and percentages were calculated, and the Chi-square test was applied for qualitative data to figure out associations between dependent and independent variables. Pie charts, graphs, tables and percentages were used to display the various effects of computer visual syndrome (CVS) as well as the differences in behavior and the risk factors leading to CVS in university school students. Informed consent was obtained from each respondent and confidentiality assured. The study was approved by the ethics committee of the Community Medicine Department of Khyber Medical College Peshawar.

RESULTS

In a total of 385 respondents surveyed, 298 (77%) belonged to medical/dental universities, 44 (11%) belonged to engineering universities and 43 (10%) students belonged to various other different universities (business, arts, humanities, law

etc.). 216 (56.2%) of the respondents were female, while 169 (43.8%) were male. The number of respondents per their respective age groups was as follows; 1 (0.2%) was less than 17 years old, 84 (21.8%) were 18 to 20 years old, 240 (62.5%) were 21 to 23 years old, 58 (15%) were 24-26 years old and 2 (0.5%) were more than 27 years old. Among the 385 respondents, 136 (35.3%) used screens for more than 5 hours per day, with 85 (22.0%) using them for 4-5 hours, 62 (16.3%) using them for 3-4 hours, 69 (17.8%) using them for 2-3 hours, 32 (8.3%) using them for 1-2 hours and 1 (0.3%) using them for less than 1 hour per day as shown in Figure 1.

The frequency of the 11 symptoms of Computer Vision Syndrome amongst the population surveyed can be seen in Table 1, which shows that the three most commonly experienced symptoms were tired eyes amongst 276 respondents (71.8%), neck and/or back pain amongst 270 respondents (70.1%) and headache amongst 163 respondents (42.3%). Chi-squared Test was applied to show the association between these three most frequent symptoms and screen usage for more than 5 hours per day amongst these university students, with significant p values (p<.05) obtained for each of these three symptoms at p=.029 for headache, p=.006 for tired eyes and p=.001 for neck and/or back pain as seen in Table 2. However, for the rest of the eight symptoms, applied chi-squared tests resulted in insignificant p values (p>.05). Amongst the 385 respondents surveyed, 71.2% said that their symptoms of CVS did not persist once they stopped screen use.

TABLE 1 (FREQUENCY OF COMPUTER VISION SYNDROME SYMPTOMS)

Symptoms of Computer Vision Syndrome	Number of university students experiencing the symptom (f)	Percentage (%)
Tired eyes	276	71.8%
Neck and/or back pain	270	70.1%
Headache during or after looking at the screen	163	42.3%
Dark circles under the eyes	141	36.5%
Distance vision becomes blurry after computer use	140	36.3%
Burning eyes	136	35.4%
Irritated or sore eyes	125	32.5%
Excessive tearing	115	29.8%
Dryness of the eyes	81	21.7%
Double vision	73	18.9%
Squinting helps when looking at the screen	65	16.8%

Figure 1: Screen use in hours/day

More than 5 hours	136
4-5 hours	85
3-4 hours	62
2-3 hours	69
1-2 hours	32
Less than 1 hours	1

Number of University Students
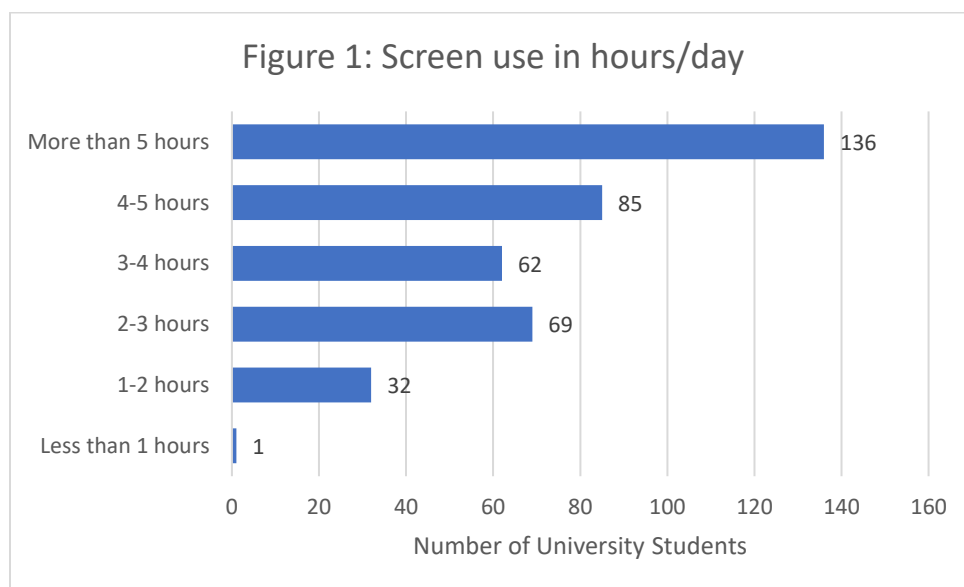
TABLE 2 (CHI-SQUARE AND P VALUES OF SOME CVS SYMPTOMS IN RELATION TO >5 HOURS OF SCREEN USE PER DAY)		
Most Prevalent Symptoms of Computer Vision Syndrome	**Chi-Square value of symptom in relation with >5 hours of screen usage per day (X^2)**	**p value using confidence intervals of 95% (p<.05 significant)**
Tired eyes	7.512	.006
Neck and/or back pain	10.478	.001
Headache during or after looking at the screen	4.772	.029
Dryness of the eyes	0.0141	.905
Distance vision becomes blurry after computer use	0.733	.392
Excessive tearing	0.659	.367

DISCUSSION

The primary purpose of this study was to investigate the frequency of screen usage amongst university students, as well as the frequency of CVS symptoms amongst university students, and the association between these two.

Our results reveal that the symptoms associated with computer visual syndrome are fairly common in university going students with as many as up to 70% of them experiencing symptoms like tired eyes (at 71.8%) and neck/back pain (at 70.8%). These findings are supported by an earlier research which determined that ninety percent of university students in Malaysia experienced symptoms related to CVS[8] and in a study by Logaraj et at., 2014 [9], carried out among students that have shown prevalence of about 81.9% CVS in Engineering students as compared to the medical students who were at 78.6%.

Regarding the frequency the screen usage amongst the university students surveyed, the vast majority of them use such devices for more than 5 hours per day (Table 1). This not explains the reason why there is such a high prevalence of CVS amongst university students since the duration of time spent in front of screens is one of the biggest factors for the development of CVS symptoms. This is in accordance with an article published in the Journal of Clinical Ophthalmology and Research (2014) [10], which revealed that somatic disorders were reported in an increasing frequency in computer users especially when the operating time was 30 hours per week.

As far as specific symptoms of CVS go, our data reveals that tired eyes are the most common overall symptom experienced by our respondents after prolonged screen use. A significantly high proportion of university students (71.8%) get tired eyes after staring at a screen for a prolonged period of time. The association of developing tired eyes with

computer has been reported in a previous research by Logaraj et al[9] which discovered a 42.8% prevalence of this symptom among engineering students. The prevalence of neck and back pain was also significantly high compared to many other symptoms of CVS for university students (at 70.1%). Similar results can be found in a report by Wahlstrom in their study[11] and in the Chennai study[9] where 61% of students reported these symptoms. Such a high prevalence is mostly due to the fact that university students often spend long periods of time sitting in an abnormal position to read notes off a laptop or a tablet, remaining stationary without allowing their upper back muscles to relax and the overworked muscles lead to a constant ache. From this we can infer that maintaining a correct posture can go a long way in reducing pain in the neck or back that is associated with prolonged computer use. This is mainly the reason why Bali J. et al in their article[10] advise the use of a chair falling into the minus category that is especially designed for computer use and provides necessary support to the back, legs, buttocks and arms. The third most common symptom in our research, headache, had a comparatively lesser percentage of university students (42.3%) who said that they experienced headache after looking at a screen for some period of time. Similar results were obtained in a research conducted in Chennai in 2014[9] where 43.3% medical and 45% of engineering students reported headache after screen use. However lower prevalence of 29.9% was reported by Talwar et al,[12] while Sen and Richardson, reported 61% among undergraduates[13.] All these researches were cross-sectional studies; however, it can be said that Eastern

researches showed a lower and hence similar incidence of headache to our research.

The rest of the less common symptoms were also similarly less incident in studies conducted elsewhere, with dry eyes, burning eyes, double vision (21.7%, 35.4% and 18.9% prevalence in our studies) showing a low incidence in studies conducted in Chennai[9,] Japan[14] and Malaysia (less than 35% of those surveyed affected) of these symptoms. These symptoms are therefore much rarer, and perhaps the habit of taking frequent breaks, blinking frequently, and resting one's eyes can help alleviate these symptoms so much so that respondents do not consider these as pertinent.

Data analysis of our research reveals that for 71.2% of the respondents, their symptoms of CVS did not persist once they stopped their screen use. This was in accordance with our expectations as CVS is a repetitive stress disorder with screen use being the stress provided to the eyes. This is also the reason why according to the Journal of Clinical Ophthalmology and Research 2014[10,] limiting the computer and screen time is postulated to have a very beneficial effect on the symptoms of CVS and advises the 20/20/20 rule where 20 min of computer use is followed by gazing into the distance in excess of 20 feet for at least 20 sec. According to a paper by the American Health Association 2005[15], taking short breaks of 5 min for every hour has been shown to decrease discomfort while not impeding productivity

Regarding the symptoms of CVS, a significant association (p=0.029) was found between duration of screen use and development of headache was found in the

case of students attending a university. A greater significant association (p=0.006) was observed between duration of screen use and getting tired eyes in the case of university students. This is in accordance with a study by Akinbinu and Mashalla in 2013[16] which reported the prevalence of eye strain to be 30.9% among users who used screens regularly for prolonged periods of time. A very significant association was also found between the duration of screen use and development of neck or back pain for university students (p=.001). These results are supported in a study carried out by Lie and Watten [17] which revealed that using computers for more than 3 hours contributed to muscle pain in the neck, as well as in the upper back region.

CONCLUSION

On the basis of the results and statistical analysis of our research study "Comparison of Computer Vision Syndrome between primary school children and university students in Peshawar ", it can be concluded that Computer Vision Syndrome in today's generation of university students in Peshawar is a prevalent problem requiring concern and action. Even in the small sample size of 385, a significant proportion was found to suffer from symptoms of CVS, with tired eyes, neck/back pain and headaches found to be the most common symptoms. Further studies are required to analyze in detail the symptomatology of CVS in not just university students, but the rest of the population as well, as well as to consider the other habits and environmental factors that may impact these symptoms.

REFERENCES

1. Pearson Student Mobile Device Survey 2015 National Report: College Students Conducted by Harris Poll This report contains public findings.
2. Loh KY, Reddy SC. Understanding and preventing computer vision syndrome. Malaysian Fam Physician. 2008;3(3):128.
3. Porcar E, Pons AM, Lorente A. Visual and ocular effects from the use of flat-panel displays. Int J Ophthalmol. 2016 Jun 18;9(6):881–5.
4. Hayes J r., Sheedy J e., Stelmack J a., Heaney C a. Computer use, symptoms, and quality of life. Optom Vis Sci. 2007;84(8):E738–55.
5. Bandela PK, Satgunam P, Garg P, Bharadwaj SR. Corneal transplantation in disease affecting only one eye: Does it make a difference to habitual binocular viewing? PLoS One. 2016;11(3).
6. Statistics c=AU; o=Commonwealth of A ou=Australian B of. Sample Size Calculator. c=AU; o=Commonwealth of Australia; ou=Australian Bureau of Statistics;
7. Iqbal M, El-Massry A, Elagouz M, Elzembely H, Schwartz SG. Article no.OR.38436 Reviewers: (1) Anil Kumar Verma, India. (2) Gabor Nemeth. Ophthalmol Res An Int J. 2018 Jan 5;8(1):1–8.
8. Reddy SC, Low CK, Lim YP, Low LL, Mardina F, Nursaleha MP. Computer vision syndrome: a study of knowledge and practices in university students. Nepal J Ophthalmol. 2013;5(2):161–8.
9. 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.
10. Bali J, Neeraj N, Bali R. Computer vision syndrome: A review. J Clin Ophthalmol Res. 2014;2(1):61.
11. Wahlström J. Ergonomics, musculoskeletal disorders and computer work [Internet]. Vol. 55, Occupational Medicine. Occup Med (Lond); 2005. p. 168–76.
12. Talwar R, Kapoor R, Puri K, Bansal K, Singh S. A study of visual and musculoskeletal health disorders among computer professionals in NCR Delhi. Indian J Community Med. 2009;34(4):326–8.
13. Sen A, Richardson S. A study of computer-related upper limb discomfort and computer vision syndrome. Vol. 36, Journal of human ergology. 2007. p. 45–50.
14. Uchino M, Schaumberg DA, Dogru M, Uchino Y, Fukagawa K, Shimmura S, et al. Prevalence of Dry Eye Disease among Japanese Visual Display Terminal Users. Ophthalmology. 2008;115(11):1982–8.

15. Preventing Occupational Disease and Injury, Second Edition. 2020

16. Raymond AT, Mashalla Y. Knowledge of Computer Vision Syndrome among computer users in the workplace in Abuja, Nigeria. 2012.

17. Lie I, Watten RG. VDT work, oculomotor strain, and subjective complaints: An experimental and clinical study. Ergonomics. 1994;37(8):1419–33.

Address for Correspondence:
Muhammad Hamza Rehman, Khyber Medical College/Teaching Hospital Peshawar-Pakistan
Cell: +92-346-9204756
Email: imuhammad196@yahoo.com