RELATIONSHIP OF SCREEN HOURS WITH DIGITAL EYE STRAIN: A CROSS SECTIONAL SURVEY FROM TEENAGERS

Saira Maroof, Syed Fawad Mashhadi, Naila Azam*, Kamran Haider, Nadia Arshad, Sundus Zulfiqar, Qamar Mehboob, Saad Khalid, Safeer Ahmed

Army Medical College/National University of Medical Sciences (NUMS) Rawalpindi Pakistan, *Armed Forces Postgraduate Medical Institute (AFPGMI)/National University of Medical Sciences (NUMS) Rawalpindi Pakistan

ABSTRACT

Objective: To determine the frequency of digital eye strain among teenagers and its association with screen hours.
Study Design: Descriptive cross sectional survey.
Place and Duration of Study: Government College Rawalpindi, from Sep 2016 to Mar 2017.
Material and Methods: Three hundred eighty five teenagers (13-19 years) from a government college Rawalpindi were interviewed using a validated structured questionnaire. Data was collected about duration of computers, laptops or smart phone use and various related ocular and extra ocular symptoms. SPSS version 20 was used for data entry and analysis.
Results: Mean age of the participant's was 14.9 ± 1.99 years while mean hours of computer, laptop or smart screen use was 2.45 ± 1.49 hours. The most frequently experienced symptoms were headache 47.3%, followed by tired eyes 33.7%, blurred vision 25%, eye strain 22.3%, lightning or glare discomfort 20.5%, irritated or sore eyes 15% and dry eyes reported by 9.6% participants. There was a statistically significant relationship between Digital Eye Strain and screen hours ($p<0.05$).
Conclusion: Digital Eye Strain was reported among half of the study participants with varying degree of severity of symptoms. Association of screen hours with Digital Eye Strain was also established.

Keywords: Digital eye strain, Extra ocular symptoms, Ocular symptoms, Screen hours.

INTRODUCTION

Digital Eye Strain is the physical discomfort felt after two or more hours in front of a digital screen and is associated with the close to mid-range distance of digital screens, including computers and other electronic displays e.g. smart phones, tablets and e-readers[1].

Viewing of electronic displays in present modern world, has become a part of daily living at home, at office, during leisure time and on the move[2]. On average, 9/10 individuals spend more than 2-3 hours Screen time according to the 2015 Digital Eye strain report[3]. With advancements in computer technology workplace has been transformed but at the same time this increasing dependence on computers and mobile phones is posing serious health threats.

There is an established relationship between screen time use and obesity[4], behavioural abnormalities and a wide array of visual abnormalities ranging from simple strain and headache[5] to refractive errors particularly myopia[3]. Symptoms of eye strain are the most commonly reported complaints among computer users[6]. Eye strain (asthenopia) is a symptom complex that involves sensations of irritation to the eye itself, changes in vision (such as blurred or double vision), and associated symptoms such as headache[7]. With the spread of visual display terminals (VDT) in offices, the numbers of workers using VDT have increased recent years. Most of their complaints have been attributed to the use of pixel containing VDT. Moreover the use of high energy violet (HEV) which is being used in computers, laptops and Mobile phones screens is thought to have high penetrationin the eyes and subsequently has proven experimentally more detrimental for eyes especially retina where it has

Correspondence: Dr Saira Maroof, Dept of Community Medicine, Army Medical College Pakistan
Email: drsairajanjua@gmail.com

shown to cause Acute Macular Degeneration proved by cadaveric studies[8,9].

Viewing digital electronic screens is not confined to adults, teenagers and older children. A literature review by Vanderloo[10] reported that preschoolers spend up to 2.4 hours per day watching electronic screens[11]. This experience of technologies range from the negative to the positive, with the bulk of research focused on risky online behaviours[12]. Less attention has been given to children's health-related outcomes of prolonged technology usage[13,14] globally, nearly 60 million people are suffering from Digital Eye Strain and about million new cases occur every

proportion. This study will help us to find out the magnitude of Digital Eye Strain among teenagers and will help to find the preventive measures that should be adopted as parental guidance to minimise deleterious health effects.

PATIENTS AND METHODS

It was a descriptive cross sectional survey conducted at a Government College Rawalpindi over period of six months from Sep 2016 to Mar 2017. Using WHO sample size calculator. Sample size was calculated to be 385 at 95% confidence interval and 5% permissible margin of error. Teenagers (13-19 years) who have an average use

Table-I: Characteristics of the participants (n=385).

Variable		Frequency (n)	Percentage (%)
Gender	Male	267	69.4
	Female	118	30.6
Year of Study	Middle	174	45.2
	Matric	185	48.1
	Intermediate	26	6.8
Use of glasses or contact lenses	Yes	74	19.2
	No	311	80.8
H/O of eye examination	Never	7	1.8
	6 months back	121	31.42
	1 year back	257	66.75
Hours of computer, laptop, smart phone use	1-3 hrs	306	79.5
	>3hrs	79	20.5

Table II: Relationship of various factors with digital eye strain (n=385).

Variable		Digital Eye Strain				p-value
		Yes		No		
		(n)	(%)	(n)	(%)	
Gender	Female	64	16.6	54	14	0.001
	Male	98	25.4	169	44	
Year of study	Middle	64	16.6	110	28.6	0.161
	Matric	86	22.3	99	25.7	
	Intermediate	12	3.2	14	3.6	
screen time	≤3 hrs	112	29	194	50.4	0.001
	>3hrs	50	13	29	7.6	

year. South Asian region also faced rapid advancement in the field of technology as in Pakistan according to PTA mobile phone users have crossed 139.2 million[15]. However national representative data of this region is not available.

There is exponential growth of computers, laptops and mobile phones especially smart phones in recent years that has increased the screen-time of an average teenager out of

of one hour or more of smart phones, laptops or computers in preceding one month and who were willing to participate were interviewed using a structured questionnaire developed after thorough literature search for Digital Eye Strain. Informed written consent was taken from the participants who were willing to participate. Non probability consecutive sampling was used for data collection. Individuals suffering from

congenital eye problems, any pre-existing medical or eye problems, using eye medicines and those who had gone any kind of eye surgery were excluded from study. Participants having any three out of nine symptoms (headache,

by tired eyes 130 (33.7%), blurred vision 96 (25%), eye strain 86 (22.3%), lightning or glare discomfort 79 (20.5%), irritated or sore eyes 58 (15%) and dry eyes reported by 37 (9.6%) participants.
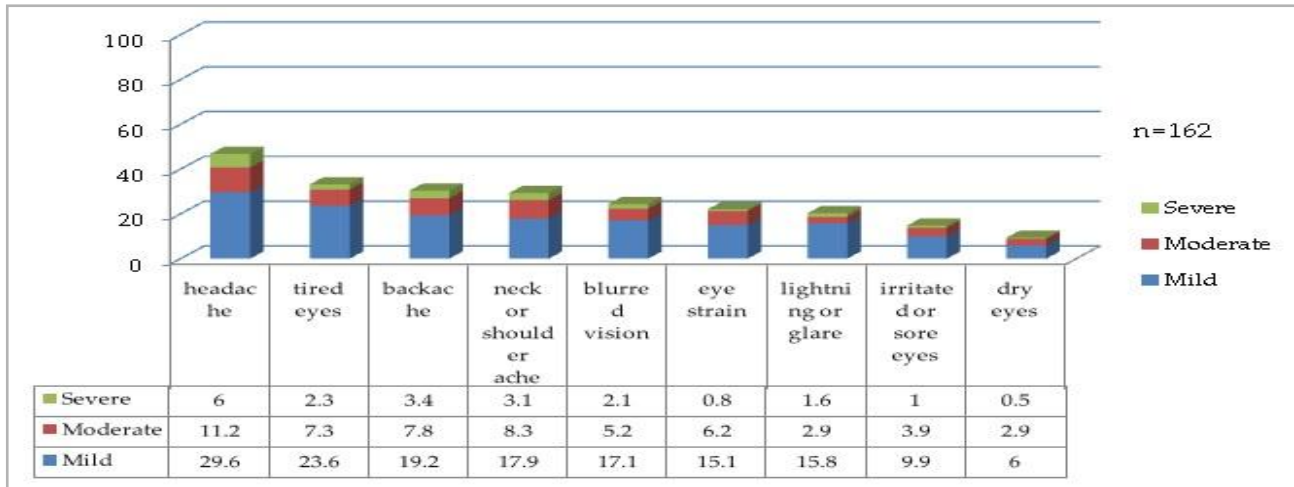

	headache	tired eyes	backache	neck or shoulder ache	blurred vision	eye strain	lightning or glare	irritated or sore eyes	dry eyes
Severe	6	2.3	3.4	3.1	2.1	0.8	1.6	1	0.5
Moderate	11.2	7.3	7.8	8.3	5.2	6.2	2.9	3.9	2.9
Mild	29.6	23.6	19.2	17.9	17.1	15.1	15.8	9.9	6

Figure-1: Severity of digital eye strain symptoms.

backache, tired eyes, neck and shoulder ache, blurred vision, eye strain, glare or sore eyes and dry eyes) were labelled as having Digital Eye Strain. The questionnaire was divided into three parts.

Data was entered and analysed using SPSS 20. Descriptive statistics in terms of frequency and percentages were used to describe qualitative variables like educational status, area of residence. Mean along with standard deviation was calculated for quantitative variables e.g. age. The association of screen hours with Digital Eye Strain was determined by using chi square test of significance. A *p*-value of ≤0.05 was considered statistically significant.

RESULTS

A total of 385 students participated in the study. The mean age of the participants was 14.9 ± 1.99 years. Mean screen hours among participants were 2.45 ± 1.49 hrs. Rest of the characteristics of the participants are given in table-I.

When the participants were inquired about the ocular symptoms the most common finding was headache reported by 182 (47.3%) followed

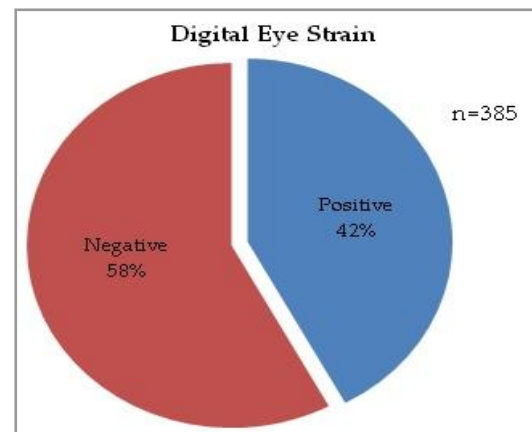As for as extra ocular symptoms are con-

Figure-2: Frequency of digital eye strain among participants.

cerned backache was reported by 120 (31.1%) and neck/shoulder ache was reported by 114 (29.6%) participants.

Severity of the reported symptoms was checked on Likert scale, depending on the scores the symptoms were classified as mild, moderate and severe. The details regarding severity of symptoms are shown in fig-1.

Scoring was done to find out the frequency of participants suffering from Digital Eye Strain, Those who had three symptoms out of total nine, irrespective of the severity of symptoms, they were labelled positive for Digital Eye Strain. It was found that 162 (42.1%) were having Digital Eye Strain while 223 (57.9%) were free from it as shown in fig-2

There was a statistically significant relationship ($p<0.05$) between gender and screen hours use with digital eye strain. However the relationship between year of study and digital eye strain was not statistically significant ($p>0.05$). Results are depicted in table-II.

DISCUSSION

In our research average screen time was 2.45 ± 1.49 hrs which is quite comparable to a research in New York[17] targeting young adult population where mean time of computer use was 3.2 ± 2.7 hours. In our study 42.1% of the participants had Digital Eye Strain which is less than 78.6% found in medical students Chennai, India[18], in Nigeria among computer users 74%[19] and 89.9% in a study among university students in Malaysia[20]. This difference is due to the difference in age groups of the participant and also depending upon their professional and academic requirements.

While exploring into Digital Eye Strain in our study the most common ocular symptom reported was headache reported by 47.3% which is similar to findings of a study in Iran 40.2%[21] and Sri Lanka 45.7%[22].

Second most reported symptom among our participants was tired eyes 33.7% which is similar to study in Ajman UAE[23] where 48% reported tired eyes. Blurred dvision was reported by 25% while in Iran[21] 37% participants had blurred vision after continuous use of screens.

In our study Eye strain was 22.3% while in Nigeria[19] it was 30.94%, lightning or glare discomfort was 20.5% while in New Yorkers[17] it was 9.3%.

In our study irritated or sore eyes 15% and dry eyes reported by 9.6% participants which is similar to seen in Digital Eye Strain Report[3] which stated dry eyes among 22% and irritated or sore eyes was reported among 38.6% of the participants of UAE[23].

Extra ocular symptoms were backache reported 31.1% and neck/shoulder ache reported by 29.6% of our participants while in Indian study backache was reported by 35.60% and neck/shoulder ache was reported by 33% of the participants.

CONCLUSION

Digital Eye Strain was reported among almost half of the study participants with varying degree of severity of symptoms. Association of screen hours with Digital Eye Strain was also established.

RECOMMENDATIONS

- Recommendations to save eyes from digital eye strain include.
- Be proactive about your vision health and monitor if excessive use is impacting your eyes. Use devices responsibly.
- Use of specialized eyewear for computer screens.
- Digital eye strain can be prevented by remembering ruleof 20-20-20, Spend 20 seconds looking at a thing 20 feet away every 20 minutes.
- Get a regular check-up every 6-12 months.
- Use a specialized setup, Glare should be minimized and work station should be optimally placed.
- Parental guidance and checks for children using smart phones, laptops and e-readers.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

REFERENCES

1. Rosenfield M. Computer vision syndrome (aka digital eye strain). Optometry 2016; 17(1): 1-10.
2. Porcar E, Pons AM, Lorente A. Visual and ocular effects from the use of flat-panel displays. Int J Ophthalmol 2016; 9(6): 881.

3. Vichitkunakorn P, Martmarn C, Tiraset N, Arunsawat P, Boonthum P, Koonalintip P, et al. Smartphone and tablet usage among medical students in Prince of Songkla university. Thammasat Med J 2016; 16(4): 634-41.

4. Marshall SJ, Gorely T, Biddle SJ. A descriptive epidemiology of screen-based media use in youth: a review and critique. J Adolescence 2006; 29(3): 333-49.

5. Thorud H-MS, Helland M, Aarås A, Kvikstad TM, Lindberg LG, Horgen G. Eye-related pain induced by visually demanding computer work. Optometry Vision Sci 2012; 89(4): e452-e64.

6. Verma S. Computers and vision. Postgrad Med J 2001; 47(2): 119.

7. Sauter SL, Chapman LJ, Knutson SJ. Improving VDT work: causes and control of health concerns in VDT use: Morgan Kaufmann Publishers Inc; 1995.

8. Dillon J, Zheng L, Merriam JC, Gaillard ER. Transmission of light to the aging human retina: possible implications for age related macular degeneration. Exp Eye Res 2004; 79(6): 753-9.

9. Iwakiri K, Mori I, Sotoyama M, Horiguchi K, Ochiai T, Jonai H, et al. Survey on visual and musculoskeletal symptoms in VDT workers. Sangyo eiseigakuzasshi. J Occupational Health 2004; 46(6): 201-12.

10. Vanderloo LM. Screen-viewing among preschoolers in childcare: a systematic review. BMC pediatrics 2014; 14(1): 205.

11. Chu C, Rosenfield M, Portello JK, Benzoni JA, Collier JD. A comparison of symptoms after viewing text on a computer screen and hardcopy. Ophthalmic Physiol Opt 2011; 31(1): 29-32.

12. Kuss DJ, Van Rooij AJ, Shorter GW, Griffiths MD, van de Mheen D. Internet addiction in adolescents: Prevalence and risk factors. Comput Hum Behav 2013; 29(5): 1987-96.

13. Do YK, Shin E, Bautista MA, Foo K. The associations between self-reported sleep duration and adolescent health outcomes: what is the role of time spent on Internet use? Sleep Medicine 2013; 14(2): 195-200.

14. Mazer JP, Ledbetter AM. Online communication attitudes as predictors of problematic Internet use and well-being outcomes. Southern Commun J 2012; 77(5): 403-19.

15. Authority PT. Pakistan Telecommunication Authority Annual Report 2015. 2015. Cited Jun 2017 available at http://www.pta.gov.pk/index.php?option=com_content&task=view&id=2184&catid=94&Itemid=1

16. 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): 141.

17. Moschos M, Chatziralli I, Siasou G, Papazisis L. Visual problems in young adults due to computer use. Klinische Monatsblätterfür Augenheilkunde. 2012; 229(04): 379-81.

18. 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.

19. Akinbinu TR, Mashalla Y. Knowledge of computer vision syndrome among computer users in the workplace in Abuja, Nigeria. J Physiol Pathophysiol 2013; 4(4): 58-63.

20. Reddy SC, Low C, Lim Y, Low L, Mardina F, Nursaleha M. Computer vision syndrome: A study of knowledge and practices in university students. Nepal J Ophthalmol 2013; 5(2): 161-8.

21. Khalaj M, Ebrahimi M, Shojai P, Bagherzadeh R, Sadeghi T, Ghalenoei M. Computer Vision Syndrome in Eleven to Eighteen-Year-Old Students in Qazvin. Biotech Health Sci 2015; 2(3): 23-9.

22. Ranasinghe P, Wathurapatha W, Perera Y, Lamabadusuriya D, Kulatunga S, Jayawardana N, et al. Computer vision syndrome among computer office workers in a developing country: an evaluation of prevalence and risk factors. BMC Research Notes 2016; 9(1): 150.

23. Shantakumari N, Eldeeb R, Sreedharan J. Computer Use and Vision. Related Problems Among University Students In Ajman, United Arab Emirate. Ann Med Health Sci Res 2014; 4(2): 258-63.

....