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

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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.

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. On average, 9/10 individuals spend more than 2-3 hours Screen time according to the 2015 Digital Eye strain report. 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, behavioural abnormalities and a wide array of visual abnormalities ranging from simple strain and headache to refractive errors particularly myopia. Symptoms of eye strain are the most commonly reported complaints among computer users. 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. With the spread of visual display terminals (VDT) in offices, the numbers of workers using VDT have increased recently. 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 penetration in the eyes and subsequently has proven experimentally more detrimental for eyes especially retina where it has...
shown to cause Acute Macular Degeneration proved by cadaveric studies8,9.

Viewing digital electronic screens is not confined to adults, teenagers and older children. A literature review by Vanderloo10 reported that preschoolers spend up to 2.4 hours per day watching electronic screens11. This experience of technologies range from the negative to the positive, with the bulk of research focused on risky online behaviours12. Less attention has been given to children’s health-related outcomes of prolonged technology usage13,14 globally, nearly 60 million people are suffering from Digital Eye Strain and about million new cases occur every 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 million15. 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 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>
<thead>
<tr>
<th>Variable</th>
<th>Frequency (n)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>267</td>
<td>69.4</td>
</tr>
<tr>
<td>Female</td>
<td>118</td>
<td>30.6</td>
</tr>
<tr>
<td>Year of Study</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle</td>
<td>174</td>
<td>45.2</td>
</tr>
<tr>
<td>Matric</td>
<td>185</td>
<td>48.1</td>
</tr>
<tr>
<td>Intermediate</td>
<td>26</td>
<td>6.8</td>
</tr>
<tr>
<td>Use of glasses or contact lenses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>74</td>
<td>19.2</td>
</tr>
<tr>
<td>No</td>
<td>311</td>
<td>80.8</td>
</tr>
<tr>
<td>H/O of eye examination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>7</td>
<td>1.8</td>
</tr>
<tr>
<td>6 months back</td>
<td>121</td>
<td>31.42</td>
</tr>
<tr>
<td>1 year back</td>
<td>257</td>
<td>66.75</td>
</tr>
<tr>
<td>Hours of computer, laptop, smart phone use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3 hrs</td>
<td>306</td>
<td>79.5</td>
</tr>
<tr>
<td>&gt;3hrs</td>
<td>79</td>
<td>20.5</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Variable</th>
<th>Digital Eye Strain</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Female</td>
<td>64 (16.6)</td>
<td>54 (14)</td>
</tr>
<tr>
<td>Male</td>
<td>98 (25.4)</td>
<td>169 (44)</td>
</tr>
<tr>
<td>Year of study</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle</td>
<td>64 (16.6)</td>
<td>110 (28.6)</td>
</tr>
<tr>
<td>Matric</td>
<td>86 (22.3)</td>
<td>99 (25.7)</td>
</tr>
<tr>
<td>Intermediate</td>
<td>12</td>
<td>14 (3.6)</td>
</tr>
<tr>
<td>screen time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤3 hrs</td>
<td>112 (29)</td>
<td>194 (50.4)</td>
</tr>
<tr>
<td>&gt;3 hrs</td>
<td>50 (13)</td>
<td>29 (7.6)</td>
</tr>
</tbody>
</table>

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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, 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 $\leq 0.05$ was considered statistically significant.

**RESULTS**

A total of 385 students participated in the study. The mean age of the participants was 14.9 $\pm$ 1.99 years. Mean screen hours among participants were 2.45 $\pm$ 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 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.

As for as extra ocular symptoms are concerned 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 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, in Nigeria among computer users 74% and 89.9% in a study among university students in Malaysia. 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 and Sri Lanka 45.7%.

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

In our study Eye strain was 22.3% while in Nigeria it was 30.94%, lightning or glare discomfort was 20.5% while in New Yorkers 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 which stated dry eyes among 22% and irritated or sore eyes was reported among 38.6% of the participants of UAE.

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 rule of 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


