ABSTRACT:

To evaluate the asthenopic symptoms in smartphone users, a study was carried out in the College of Ophthalmology and Allied Vision Sciences (Mayo Hospital) Lahore from May to July 2018. This Cross-Sectional study was done with 250 people both from medical and non-medical backgrounds. In the study, out of 250 cases 138 (55.2%) were related to non-medical (university students of different disciplines) and the rest 112 individuals (44.8%) belonged to the medical field. Individuals of the average age of 26.91 ± 3.90 years were considered that had been using the smartphone for the last one year. Eye-problems like headaches, eye strain, double vision, redness, watery eyes, and blurred vision were recorded in 202 (80.8%) cases. Data were analyzed using Chi-square and Fisher's exact test methods. SPSS (version 21) was used and significant (p < 0.05) differences were found in symptoms that were significantly associated with age and smartphone usage time. It was concluded by the study that asthenopic symptoms were mostly found in adults who were using smartphones for more than 3-4 hours per day without any break, whether they belonged to the medical or non-medical field.

Keywords: Eye strain, Smartphone, asthenopic, Symptoms, medical, non-medical

INTRODUCTION

Smartphones were made commercially available from 1984 and were invented by Motorola in 1973 (Heeks, 2008). The use of the mobile phone is increasing day by day. New Time Mobility Poll reported in 2012 that almost 84% of people could not live a single day if their mobile phone...
devices were taken out of them (Duerson, 2012).

Nonspecific symptoms of eye strain include headache, tiredness, and pain around the eyes, blurred vision, and double vision (Jaiswal et al., 2019). Electronic devices have different applications and internet access like smartphones, Blackberry, iPhones are widely available. They have converted into mobile computers. Most people are unaware of electromagnetic radiation effects so an increased risk of smartphone addiction is recorded (Subramani et al., 2017).

Smartphone users have eye strain symptoms due to the brightness of the screen. Phones have negative effects on health in that case. By having a phone, one can stay in touch all over the world but the radiations emitted by phones are dangerous to health (Isabelle, 2017).

By using the smartphones, certain issues like photophobia, disturbance of rest, lack of concentration, the impairment of short-term memory, flushing of periocular skin, disorientation, and high blood pressure have been discussed in a study conducted on females (Jamal et al., 2012). Smartphone users have problems with uneasiness, a general feeling of ill-being, nausea, dull-mindedness, and also fatigue. With the excessive and persistent use of mobile phones, teenagers have restlessness and more anxiety. Prolonged reading from a smartphone could cause worse asthenopic symptoms than hardcopy (Antona, 2018). The extensive use of digital devices gives a large amount of radiations and encompasses visual and ocular symptoms (Sheppard and Wolffsohn, 2018). Youngsters are addicted to mobile phones, so they may have ocular symptoms of digital eyestrain like fatigue, double vision, and tearing. (Coles-Brennan et al., 2019).

The term “computer vision syndrome” for the misuse/overuse of mobile phones used by the WHO (World Health Organization) (Newman and Smith, 2016). The use of the computer is very common in schools, colleges, universities, and workshops with the progress of technology. Many visual symptoms are interrelated to computer vision syndrome. Computer vision syndrome causes many public health problems and the use of the computer is very excess in developing countries. The occurrence of eye symptoms associated with visual display terminals and computer users differ vastly (Mashalla, 2014).

The dependency on electronic devices revealed that it is the major reason for eye problems.

There may be a lack of research to figure out the effect of high exposure in students in developing cell phone vision syndrome. Students (83%) were examined and have symptoms, out of which (44%) had eye strain (Sadagopan et al., 2017).

The motivation of the study was to identify different variables related to
asthenopia like neck pain, irritation, blurred vision, eyestrain, and time duration. Smartphone users have more asthenopic symptoms due to excessive use of smartphones when they use without any break.

The purpose of the study was to find asthenopic symptoms in smartphone users.

MATERIALS AND METHODS

A descriptive cross-sectional study was performed with 250 persons both from the medical and non-medical fields. A simple random sampling technique was used and a semi-structured questionnaire was filled for the collection of data. The study was conducted for 3 months between May-July 2018 in the College of Ophthalmology and Allied Vision Sciences (Mayo Hospital) Lahore. Descriptive statistics were used to explain the data generated to know about eye strain indicators in smartphone users.

Data were analyzed by using Chi-squared and Fisher's exact test methods with the SPSS (version 22). Odds Ratio (OR) and confidence interval were used to evaluate the risk of different symptoms of eyestrain.

RESULTS AND DISCUSSION

250 individuals with age range 20-32, mean age and standard deviation of (26.91 ± 3.90 years) were considered in the study. Out of 250 participants from both gender, 138 (55.2%) were related to the non-medical file, while, 112 (44.8%) were from the medical field. In the study 93 participants were males and 157 were females with a percentage of 37.2% and 62.8% respectively. It was noticed that 90% of participants used a smartphone while they were at work and 10% continued to use these gadgets without respite even after working hours. The people who used smartphones for up to 4 hours had eye problems likewise, the individuals who used smartphones for 4 years had more eye strain disorders (Fig. 1 and 2). Long et al. (2017) also reported excessive use and long duration affects the eyes badly and enhance eye diseases.
Fig. 1: Frequency of using mobile phone per hour

Fig. 2: Time spent on mobile phone in years
The professionals faced eye problems even when they were not at work. Out of them, 38.86% have pain in the eyes due to overuse of smartphones, 39.34% have eye irritation, and 53.08% have distorted vision. Almost 32.23%, 31.75%, 11.85% complained about pain in the neck, eye strains, and dryness of the eyes respectively (Fig. 3-8). Mvungi (2009) reported in a study, that 136 smartphone users have eye strain complications where 55% have a burning sensation, 61% accounted for a portion of headache, 46% complained of eye redness. 87% have an issue of eye weariness (Mvungi, 2009). Han et al. (2017) and Isabelle, (2017) also reported excessive usage of smartphones produced eye dryness.

Fig. 3: Complaint of pain in eyes due to over-usage

Fig. 4: Feeling irritation of eyes
Assessment of Causes of Eyestrain in Smartphone Users

Fig. 5: Ratio of people having a blurred vision of eyes

Fig. 6: Ratio of people experiencing strain/pain on the neck
Fig. 7: Issues of eye strain

Fig. 8: Xerosis of eyes due to working
For getting respite 30.80% of participants decided to take a break on their seat, 25.20% liked to roam in the free area, 22.0% practiced to close their eyes and 5.20% blinked the eyes often to take a break while working (Fig. 9). A number of studies have proved that usage of smartphones had bad impacts on eyes (Rosenfield, 2016; Priya and Subramaniyam, 2020; Priya et al., 2020). Proper light, rest breaks, and sitting postures can improve eye health.

It is also important to take rest by using any means such as blinking eyes, focusing after the interval to another site, leaving a seat, etc. This will help in the rest of the eyes, reduce tiredness and stress. This technique is very valuable for youngsters who may be new to use a phone. It is important to practice healthy habits to keep the vision pure and healthy (Logaraj et al., 2014; Sadagopan et al., 2017).

Fig. 9: Preventive ways for easing eye strain symptoms

83.60% of smartphone users have awareness about eye strain symptoms that result as a result of excessive usage of smartphones and 16.40% were unaware of such symptoms. The understanding of smartphone users regarding different symptoms was also recorded. 65.60% showed eye strain and blurred vision as a result of extended smartphone usage, 11.60% have only heard about healthy practices but do not know what it means and 6.80 even not heard about such practices such as blinking eyes, focusing some other objects during smartphone usage. Only 6.40% of individuals know about the redness of eyes and only 9.60% agreed to wear glasses while working (Fig. 10). A similar study was investigated in Benin Nigeria that mobile phone syndromes or computer vision syndromes affect the visual conditions and 32% of respondents agreed that it upsets human health and eye strain occurs (Chiemeke et al., 2007).
Individual's view on eye strain problems was also recorded. 48.05% agreed that continued staring at the smartphone screen damages the eyes, 19.48% agreed that too bright a screen was the main reason and 4.76% think that their poor eyesight was behind the reason for eye strain (Fig. 11). Figure 12 showed 66.80% were taking regular breaks as preventive measures to minimize the risk of such indications. Furthermore, headache, blur vision, watery and dry eyes, and redness were found to be strongly associated (all have p-values less than 0.05) with age and mobile phone usage time (Table 1). According to various studies, eye strain symptoms were categorized into Optic issues (e.g., watery and dry eyes, red eyes and ablaze eyes), visual misperception (e.g., headache, eye strains, Blurred and red), and the third posture-related indications (e.g., sore back, neck pain, shoulder pain) (Moawad and Jones, 2020; Maïssa et al., 2012; Gowrisankaran and Sheedy, 2015). In the present study, dryness of eyes neck ache, backache are a crucial factors in symptoms leading to eye diseases.
Risk estimates were also analyzed by using the Fisher extract test and p-values are given in Table 1. A significant p-value was recorded for headache, eye strain, redness of eyes, and blur vision. These p-values are less than 0.05, and statistically, significant risk factors are associated with the usage of smartphones.
Table 1: Fisher Exact Test Result for the Risk Estimates of eye problems

<table>
<thead>
<tr>
<th>Parameters</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache</td>
<td>0.03*</td>
</tr>
<tr>
<td>Eye strains</td>
<td>0.003*</td>
</tr>
<tr>
<td>Dual vision</td>
<td>0.596</td>
</tr>
<tr>
<td>Redness</td>
<td>0.031*</td>
</tr>
<tr>
<td>Watery eyes</td>
<td>0.455</td>
</tr>
<tr>
<td>Dry eyes</td>
<td>0.776</td>
</tr>
<tr>
<td>Blur Vision</td>
<td>0.000*</td>
</tr>
</tbody>
</table>

*Shows significant P-Values

**CONCLUSION**

The overuse of mobile phones mainly in the young generation can lead to blurring of vision, eye strains, dryness of eyes, visual fatigue, neck pain, and double vision, etc. So frequent breaks and blinking is necessary while using smartphones or digital devices for a long time.

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**REFERENCES**


4. Duerson MH (2012). We're addicted to our phones: 84% worldwide say they couldn't go a single day without their mobile device in their hand. Daily News. 16: 16.


8. Isabelle Z (2017). Smartphones linked to rising cases of dry-eye disease and digital eye strain.


