

Impact of Prolonged Mobile Phone and Digital Device Use on Visual Symptoms and Ocular Surface Health among patients attending the Ophthalmology Clinic at Swat Medical Complex and Teaching Hospital

NAWAB ALI KHAN¹, ABSHAR AHMAD², JAMAL HUSSAIN³

¹ MBBS FCPS Consultant Ophthalmologist Department of Ophthalmology Timergara Teaching Hospital Dir Lower

² MBBS MCPS Consultant Ophthalmologist Department of Ophthalmology Timergara Teaching Hospital Dir Lower

³ Assistant Professor Ophthalmology Swat Medical College and Swat Medical Complex

Correspondence to: Jamal Hussain, Email: hassanjamal82@yahoo.com

ABSTRACT

Background: The widespread use of mobile phones and digital devices has increased concerns regarding their potential impact on ocular health. Prolonged screen exposure may lead to visual symptoms and disturbances of the ocular surface.

Objective: To evaluate the impact of prolonged mobile phone and digital device use on visual symptoms and ocular surface health among patients attending an ophthalmology clinic.

Methods: This was a hospital-based descriptive cross-sectional study conducted at Swat Medical Complex Teaching Hospital from May 2022 to May 2023 including 220 patients attending the ophthalmology clinic.

Results: The mean age of participants was 29.8 ± 10.6 years with an average screen time of 6.4 ± 2.1 hours per day. Smartphones were the most commonly used devices (62.7%). Eye strain was reported by 57.3% of participants, dryness by 44.5%, headache by 41.4%, and blurred vision by 33.6%. The mean tear break-up time was 8.9 ± 3.2 seconds, and reduced tear production was observed in 41.8% of participants. Clinical dry eye was diagnosed in 40.0% of cases.

Conclusion: Prolonged digital device use is associated with a high frequency of visual symptoms and ocular surface abnormalities. Preventive measures such as limiting screen exposure, taking regular breaks, and promoting safe digital habits may help reduce digital eye strain and improve ocular health.

Keywords: Digital eye strain; Mobile phone use; Computer vision syndrome; Ocular surface health; Dry eye disease

INTRODUCTION

The intensive use of smartphones, computers, tablets, and other digital products has changed contemporary lifestyles and communication trends. As more people depend on digital technology for work, education, and entertainment, screen exposure time continues to increase. Although digital devices provide many advantages, prolonged exposure has raised concerns regarding its effects on ocular health and vision¹⁴. Computer vision syndrome, also known as digital eye strain, has become increasingly common among individuals who use digital devices extensively¹⁹. Digital eye strain refers to a group of visual and ocular symptoms caused by prolonged screen use, including eye fatigue, dryness, irritation, burning sensation, blurred vision, headache, and difficulty focusing³. These symptoms are often associated with continuous screen use without adequate rest or ergonomic adjustments⁴. Prolonged screen exposure increases visual demand and may lead to discomfort and reduced visual performance⁵.

One of the key mechanisms involved is the reduced blink rate during screen use. Studies have shown that blink frequency significantly decreases while viewing digital screens, resulting in increased tear film evaporation and dryness of the ocular surface¹⁶. This instability of the tear film may contribute to the development of dry eye disease and ocular surface irritation¹. Additionally, accommodative stress and visual disturbances may occur with prolonged use of digital devices⁸.

The ocular surface plays a critical role in maintaining visual clarity and comfort. Environmental and behavioral factors, such as prolonged screen time, can disrupt tear film stability and negatively affect ocular surface health⁹. Reduced and incomplete blinking, along with sustained visual focus, further contribute to ocular discomfort among digital device users¹⁰. Another concern associated with digital devices is exposure to blue light emitted from screens. Blue light has been linked to visual fatigue and may also affect circadian rhythms and sleep patterns, particularly with nighttime exposure²⁰. Although long-term ocular effects of blue light are still under investigation, several studies have associated it with symptoms of digital eye strain¹⁹.

With the widespread use of smartphones globally, screen exposure has become almost unavoidable. Young adults and

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adolescents represent the highest users of mobile devices, often spending several hours daily on screens⁸. This prolonged exposure increases the risk of visual symptoms and ocular surface abnormalities¹⁴. Clinical studies have consistently demonstrated a strong association between prolonged digital device use and symptoms such as eye strain, dryness, and blurred vision¹⁵. Understanding usage patterns and their impact on ocular health is essential for developing preventive strategies and promoting safe digital habits¹³.

Objective: To evaluate the impact of prolonged mobile phone and digital device use on visual symptoms and ocular surface health among patients attending an ophthalmology clinic.

METHODOLOGY

This was a hospital-based descriptive cross-sectional study conducted at Swat Medical Complex Teaching Hospital from May 2022 to May 2023 including 220 patients attending the ophthalmology clinic.

Inclusion Criteria

- Patients aged 15 years and above using mobile phones or digital devices for at least 2 hours per day.
- Patients presenting with visual complaints or attending routine ophthalmology clinic visits.
- Patients willing to participate and provide informed consent.

Exclusion Criteria

- Patients with previously diagnosed chronic ocular surface diseases unrelated to digital device use.
- Patients with a history of ocular surgery within the past six months.
- Patients with systemic diseases known to affect the ocular surface such as severe autoimmune disorders.

Data Collection: After obtaining informed consent, demographic and clinical data were collected using a structured questionnaire. Information regarding age, gender, occupation, average daily duration of digital device use, type of device used (mobile phone, computer, tablet), and screen viewing habits was recorded. Participants were also asked about the presence of visual symptoms such as eye strain, dryness, burning sensation, blurred vision, headache, and photophobia. A comprehensive ophthalmic examination was performed including visual acuity testing, slit-lamp examination, tear film evaluation, and ocular surface

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assessment. Tests such as tear break-up time (TBUT) and Schirmer test were performed to evaluate ocular surface health. All clinical findings and symptom data were systematically recorded.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using SPSS version 26. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Associations between duration of digital device use and ocular symptoms were analyzed using chi-square test or independent t-test where appropriate. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 220 participants were included with a mean age of 29.8 ± 10.6 years. The majority were aged 15–25 years (84, 38.2%) followed by 26–35 years (69, 31.4%). Males constituted 126 participants (57.3%) while females accounted for 94 (42.7%). Students were the largest group (92, 41.8%) followed by office workers (64, 29.1%). The mean daily screen time was 6.4 ± 2.1 hours.

Smartphones were the most commonly used devices (138, 62.7%), followed by computers or laptops (48, 21.8%). Nearly half of the participants used digital devices for 5–7 hours daily (98, 44.5%), while 66 participants (30.0%) used them for ≥8 hours. Screen use before sleep was reported by 141 participants (64.1%). Only 72 participants (32.7%) took regular breaks, whereas 148 (67.3%) reported continuous screen use.

Eye strain was the most common symptom reported by 126 participants (57.3%), followed by dryness of eyes in 98 participants (44.5%). Headache was reported by 91 participants (41.4%), burning sensation by 82 participants (37.3%), and blurred vision by 74 participants (33.6%). These findings indicate a high frequency of visual discomfort associated with prolonged screen exposure.

Table 1. Demographic Characteristics and Digital Device Usage of Study Participants (N = 220)

| Variable | Category | n (%) / Mean ± SD |
|-------------|---------------------------------|-------------------|
| Age (years) | Mean age | 29.8 ± 10.6 |
| Age Group | 15–25 years | 84 (38.2%) |
| | 26–35 years | 69 (31.4%) |
| | 36–45 years | 41 (18.6%) |
| | >45 years | 26 (11.8%) |
| Gender | Male | 126 (57.3%) |
| | Female | 94 (42.7%) |
| Occupation | Students | 92 (41.8%) |
| | Office workers | 64 (29.1%) |
| | Housewives | 34 (15.5%) |
| | Others | 30 (13.6%) |
| | Average Screen Time (hours/day) | Mean duration |

Table 2. Pattern of Digital Device Use Among Participants

| Variable | Category | n (%) |
|-------------------------|------------------|-------------|
| Primary Device Used | Smartphone | 138 (62.7%) |
| | Computer/Laptop | 48 (21.8%) |
| | Tablet | 18 (8.2%) |
| | Multiple devices | 16 (7.3%) |
| Daily Screen Time | 2–4 hours | 56 (25.5%) |
| | 5–7 hours | 98 (44.5%) |
| | ≥8 hours | 66 (30.0%) |
| Screen Use Before Sleep | Yes | 141 (64.1%) |
| | No | 79 (35.9%) |
| Regular Screen Breaks | Yes | 72 (32.7%) |
| | No | 148 (67.3%) |

Table 3. Frequency of Visual Symptoms Associated with Digital Device Use

| Variable | Category | n (%) |
|-------------------------------------|----------|-------------|
| Eye Strain | Present | 126 (57.3%) |
| | Absent | 94 (42.7%) |
| Dryness of Eyes | Present | 98 (44.5%) |
| | Absent | 122 (55.5%) |
| Burning Sensation | Present | 82 (37.3%) |
| | Absent | 138 (62.7%) |
| Blurred Vision | Present | 74 (33.6%) |
| | Absent | 146 (66.4%) |
| Headache Associated with Screen Use | Present | 91 (41.4%) |

| | | |
|--|--------|-------------|
| | Absent | 129 (58.6%) |
|--|--------|-------------|

Table 4. Ocular Surface Assessment Findings Among Participants

| Variable | Category | n (%) / Mean ± SD |
|------------------------------|-----------------------|-------------------|
| Tear Break-Up Time (seconds) | Mean TBUT | 8.9 ± 3.2 |
| | TBUT Category | |
| | ≥10 seconds (Normal) | 86 (39.1%) |
| | <10 seconds (Reduced) | 134 (60.9%) |
| Schirmer Test (mm/5 min) | Mean value | 11.7 ± 4.6 |
| | Schirmer Category | |
| | ≥10 mm (Normal) | 128 (58.2%) |
| | <10 mm (Reduced) | 92 (41.8%) |
| Clinical Dry Eye Diagnosis | Present | 88 (40.0%) |
| | Absent | 132 (60.0%) |

The mean tear break-up time was 8.9 ± 3.2 seconds, with reduced TBUT observed in 134 participants (60.9%). The mean Schirmer test value was 11.7 ± 4.6 mm, with reduced tear production in 92 participants (41.8%). Overall, clinical dry eye was diagnosed in 88 participants (40.0%), suggesting a strong association between prolonged digital device use and ocular surface disturbances.

DISCUSSION

This study evaluated the effects of prolonged use of mobile phones and digital devices on visual symptoms and ocular surface health among patients attending an ophthalmology clinic. The mean age of participants was 29.8 ± 10.6 years, with the majority belonging to the 15–25 years age group. These findings indicate that young adults are the primary users of digital devices. Similar demographic trends have been reported in previous studies, where digital eye strain was found to be more prevalent among younger populations due to extensive use of smartphones and computers for academic, occupational, and recreational purposes¹⁷.

Analysis of digital device usage patterns revealed that smartphones were the most commonly used devices (62.7%). Nearly half of the participants used digital devices for 5–7 hours daily, while 30% reported usage of ≥8 hours per day. Additionally, a significant proportion reported screen use before sleep and lack of regular breaks. These findings are consistent with previous studies demonstrating that prolonged screen exposure and poor viewing habits are strongly associated with ocular discomfort and digital eye strain¹⁸.

Visual symptoms were highly prevalent among participants, with eye strain being the most common, followed by dryness, headache, burning sensation, and blurred vision. These findings indicate a substantial burden of visual discomfort associated with digital device use. Similar results have been reported in earlier studies, where eye strain and dryness were identified as the most frequent symptoms among heavy digital device users¹⁴.

Ocular surface assessment further revealed evidence of tear film instability. The mean tear break-up time was reduced in a significant proportion of participants, and decreased tear production was observed in many cases. Overall, 40% of participants were diagnosed with clinical dry eye. These findings are consistent with previous studies that have shown prolonged digital screen use leads to reduced blink rate, increased tear evaporation, and a higher prevalence of dry eye disease¹⁶.

Overall, the findings of this study highlight the significant impact of prolonged digital device use on ocular health. The high prevalence of visual symptoms and ocular surface abnormalities underscores the need for preventive strategies. Measures such as limiting screen time, maintaining appropriate viewing distance, taking regular breaks, and increasing awareness about healthy digital habits can help reduce the burden of digital eye strain and promote better ocular health¹³.

CONCLUSION

It is concluded that prolonged use of mobile phones and digital devices is significantly associated with visual symptoms and ocular surface disturbances. A large proportion of participants experienced eye strain, dryness, headache, and blurred vision,

while clinical evaluation revealed reduced tear break-up time and decreased tear production in many cases. These findings indicate that excessive screen exposure may contribute to digital eye strain and dry eye symptoms. Awareness regarding healthy screen habits, regular breaks, and proper ergonomic practices is essential to reduce ocular discomfort and maintain ocular surface health.

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