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Eye Health Problems Related to Prolonged Exposure to Electronic Devices

Nur Mahmudah Elmaje[1], Dahlan Latuconsina[2], Andiar Putra[2]

[1]*Specialist Ophthalmology Education Study Program, Universitas Diponegoro, Indonesia*
[2]*Medical School, Universitas Diponegoro, Indonesia*

**Corresponding Author: Nur Mahmudah Elmaje*
E-mail: numhdgafd@gmail.com

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Abstract

The increasing dependence on electronic devices in occupational, educational, and recreational activities has intensified concerns regarding eye health problems associated with prolonged screen exposure. This study aimed to examine the prevalence of visual discomfort among adult electronic device users and to identify behavioral, environmental, and individual factors influencing ocular health outcomes. A quantitative cross-sectional design was employed involving 300 respondents aged 18 years and above who routinely used electronic devices for at least two hours daily. Data were collected through structured questionnaires assessing screen exposure patterns, ergonomic conditions, behavioral practices, and self-reported eye health symptoms. The findings revealed a high prevalence of digital eye strain symptoms, particularly eye fatigue, dry eyes, blurred vision, and headaches. Prolonged screen exposure exceeding six hours daily emerged as the strongest predictor of visual discomfort, while irregular visual breaks, excessive screen brightness, close viewing distance, and corrective lens use further increased symptom prevalence. The novelty of this study lies in its multidimensional analytical framework integrating behavioral, environmental, and physiological determinants within broader non-clinical populations. The findings highlight the importance of integrated preventive strategies combining ergonomic improvements, digital-wellbeing education, and institutional support to promote sustainable and healthier digital technology use.

INTRODUCTION

Digital technology has significantly changed the modes of communication, education, work and social interaction in modern societies. The use of electronic devices like smartphones, tablets, laptops, and desktop computers is now an essential part of modern life, leading to over-exposure to them among all ages. The widespread adoption of screen-based technologies today has brought a lot of efficiency, accessibility, and connectivity to the workplace, the education sector, and the leisure industry (Cullen et al., 2024; Pant, 2025). However, at the same time, the

use of electronic devices has increased worries about their damaging effects on the physical and visual health. Long hours of screen use, in particular, have become a significant public health concern due to its connection with eye discomfort, fatigue, and other eye health problems (Ali et al., 2023; Bagaji & Rao, 2025; Gajewski et al., 2025; Joshi et al., 2025; Shah et al., 2025; Zaky et al., 2026; Almohammadi, 2026).

Increasing complaints of ocular symptoms with digital device use has received increasing academic interest in this phenomenon referred to as digital eye strain or computer vision syndrome. It has been previously shown that long-term exposure to digital screens is associated with various eye symptoms, such as dry eyes, headache, burning sensation, and impaired visual focusing (Mehra & Galor, 2020; Aghaei & Abdolalizadeh, 2023; Kaur et al., 2025). This is mostly associated with sustained near vision work, decrease in blink rate, accommodative stress and exposure to artificial light from digital displays. Physiological studies have also revealed that prolonged screen time reduces tear-film stability and leads to greater stress to the ocular surface, which consequently causes visual fatigue and discomfort (Lin et al., 2025; McMonnies, 2025; Kaur et al., 2022). This indicates that digital technology, besides its contribution in supporting modern productivity and communication, also poses great challenges in maintaining visual health.

The need for intervention in eye health issues associated with electronic device use has grown more dire with the worldwide surge in reliance on electronic devices in educational and occupational environments (Vettriselvan et al., 2025; Tsang et al., 2023). On average, people are spending more time on screens per day than ever before, with remote learning systems, online working environments and digitally mediated communication playing a major role in this. Epidemiologic evidence suggests that extended screen time is associated with significantly increased risk for ocular discomfort and visual strain when compared to shorter exposures to digital devices (Zayed et al., 2021; Parrey et al., 2023). Furthermore, the World Health Organization have highlighted how preventable visual impairment is a worldwide health problem which demands broad-based focused prevention and awareness strategies (Keel et al., 2022; Abdulhussein & Abdul Hussein, 2023). Even with this awareness, screen-induced eye strain is often regarded as a typical side effect of a digital lifestyle, and many people do not realize the potential long-term damage from repeated eye strain.

There are several factors that have been documented to affect the impact of e-device use on eye health issues. An excessive duration of screen use, a lack of visual breaks, and constant near-focus activities have been repeatedly linked with higher visual fatigue and dry-eye symptoms (Sigamani et al., 2022; sMajszyk et al., 2026). Health outcomes of visual function are also significantly influenced by environmental and ergonomic factors. Poor lighting, incorrect screen brightness, glare exposure, and improper viewing distances are all significant factors in ocular discomfort, as they can increase visual workload and accommodative stress (McKee & Hedge, 2022; Sengsoon et al., 2026). Moreover, individual factors like age, refractive status, and corrective lens usage, add to the susceptibility to digital eye strain, showing that the visual health issues arise from the interplay of behavioral, environmental, and physiological factors, rather than solely from screen exposure. (Nakshine et al., 2022; Barata et al., 2025).

Various preventive approaches have been put forward in the literature in response to these concerns. The 20-20-20 rule, the correct setup of workstations, forced blinking, controlling screen brightness, and regular eye examinations have become popular recommendations to avoid visual discomfort (Rahman et al., 2024; Chowdhury, 2024). In addition, technological solutions like blue-light filtering lenses, and adaptive display technologies have also been gaining more and more interest as potential mitigation strategies. But results from their application are

inconclusive. The results from several studies indicate that exposure to blue light is a potential cause of visual fatigue and circadian rhythm disorders, and other studies have found insufficient evidence for significant clinical effects from interventions that filter out blue light (Wong & Bahmani, 2022; Singh et al., 2023; Haghani et al., 2024). This discrepancy suggests that preventive strategies currently in place are not fully linked to other behavioral and environmental approaches and are fragmented.

Although digital eye strain research has advanced considerably in the past decade, there remain several areas of uncertainty. First, many previous studies have focused on a particular group of subjects (such as office workers, students at the University of...), and therefore limited generalizations to other non-clinical populations. Secondly, previous research studies have tended to be focused on particular risk factors and not a combination of behavioral practices, environment and individual characteristics. Third, the existing studies mostly rely on symptom reporting from cross-sectional data and descriptive prevalence analysis with limited understanding of the multidimensional mechanisms involved in the eye health disturbances associated with electronic device use (Tsang et al., 2023; Barata et al., 2025). Hence, the existing literature is lacking of integrative empirical models that can explain the outcome of eye health, as a result of the interactions between different determinants of exposure.Therefore, there is a lack of integrative empirical models in the literature that can explain the outcome of eye health in increasingly digitalized environments, as a function of the interactions between different determinants of exposure.

This literature gap highlights the importance of further research using a multidimensional analytic approach to explore the eye health problems associated with prolonged electronic device use. A knowledge of the interactions the duration of screen exposure, the work conditions, behaviors, and susceptibility of individuals is crucial to designing more successful preventive strategies and evidence-based public health interventions. Moreover, there is a need for more in-depth empirical studies to underpin institutional policies supporting positive digital uses in the learning, work and home setting.

The purpose of this study is to investigate the eye health issues of the use of electronic devices for long durations by determining the prevalence of visual symptoms and studying behavioural, environmental and individual factors that may contribute to eye discomfort in digital device users. The novelty of this research is the integrative analytical framework that included multiple determinants of digital eye strain and not just analyzing individual determinants individually. This study explores trends in electronic device use among the wider non-clinical population, as opposed to previous studies that were more specific in their occupational and educational groups; this offers a more complete picture of digital eye health. The results will provide theoretical background for the creation of multi-dimensional viewpoints on digital eye strain and practical background for the formulation of strategies for prevention, ergonomic recommendations, and public health policies for long-term and health supporting digital technology use.

METHODS

Research Design

This study employed a quantitative cross-sectional research design to examine eye health problems associated with prolonged exposure to electronic devices among active digital technology users. The cross-sectional approach was selected because it enables the systematic assessment of exposure patterns and visual health outcomes within a defined population at a single point in time. This design is widely applied in public health and epidemiological studies investigating digital eye strain and computer vision syndrome because it allows researchers to identify prevalence patterns and evaluate relationships between screen exposure and ocular symptoms

efficiently (Mataftsi et al., 2023). The study adopted a descriptive-analytical framework to explore how behavioral, environmental, and individual factors contribute to visual discomfort resulting from prolonged screen use.

The research was conducted in the context of increasing digital dependency in occupational, educational, and recreational activities. Participants represented individuals who routinely used electronic devices such as smartphones, laptops, desktop computers, and tablets for daily communication, learning, and work-related purposes. The study focused on non-clinical adult populations to provide broader empirical insights into eye health problems occurring in everyday digital environments.

Participants and Sampling Technique

The target population of this study consisted of adults aged 18 years and above who regularly used electronic devices for at least two hours daily. The minimum exposure duration was determined based on previous studies indicating that prolonged screen exposure exceeding two hours significantly increases the risk of digital eye strain and visual discomfort. A purposive sampling technique was employed to recruit respondents who met the inclusion criteria and demonstrated sufficient engagement with digital devices in daily activities.

A total of 300 respondents participated in the study. The participants represented various demographic backgrounds and patterns of digital device usage, enabling the investigation of different levels of screen exposure and associated eye health symptoms. Table 1 presents the socio-demographic characteristics and electronic device use patterns of the respondents.

Table 1. Socio-demographic characteristics and electronic device use patterns of respondents

Variable	Category	n	%
Age	18–25 years	92	30.7
	26–35 years	114	38.0
	36–45 years	62	20.7
	>45 years	32	10.6
Gender	Male	138	46.0
	Female	162	54.0
Daily screen time	2–4 hours	64	21.3
	5–6 hours	98	32.7
	>6 hours	138	46.0
Main device used	Smartphone	144	48.0
	Computer/Laptop	118	39.3
	Tablet	38	12.7

Source: Primary survey data processed by the researchers, 2026

Data Collection Technique

Data were collected using a structured self-administered questionnaire adapted from validated instruments commonly used in studies on digital eye strain and visual health assessment. The questionnaire consisted of four major sections covering socio-demographic information, electronic device usage patterns, environmental and ergonomic conditions, and self-reported eye health symptoms. Variables related to screen exposure included duration of daily screen time, type of electronic device used, frequency of visual breaks, screen brightness adjustment, and viewing distance.

The assessment of eye health symptoms focused on commonly reported manifestations of digital eye strain, including eye fatigue, dry eyes, blurred vision, headaches, burning sensations, and difficulty focusing. These indicators were selected based on previous ophthalmological and occupational health studies demonstrating their relevance to prolonged screen exposure (Kaur et al., 2022; Barata et al., 2025). Data collection was conducted anonymously to encourage honest responses and reduce reporting bias. Prior to participation, respondents received information regarding the purpose of the study, voluntary participation, confidentiality, and informed consent procedures in accordance with ethical principles for human-subject research.

Validity and Reliability

To ensure content validity, the questionnaire was reviewed by experts in public health and ophthalmology to evaluate the relevance, clarity, and appropriateness of the measurement items. Several revisions were conducted based on expert recommendations to improve the comprehensibility and consistency of the instrument. A pilot study involving a small group of respondents was subsequently conducted to assess item clarity and instrument reliability before the main data collection process. Reliability analysis was performed using Cronbach's Alpha coefficient to evaluate the internal consistency of symptom-related items. The instrument demonstrated acceptable reliability levels consistent with methodological standards for survey-based health research. These procedures strengthened the credibility and methodological rigor of the study findings.

Data Analysis

The collected data were analyzed using statistical software to ensure systematic and transparent data processing. Descriptive statistical analysis was initially conducted to summarize respondents' demographic characteristics, patterns of electronic device use, and prevalence of eye health symptoms. Frequencies, percentages, means, and standard deviations were used to describe the distribution of key variables.

Inferential statistical analyses were subsequently performed to examine the relationships between prolonged electronic device exposure and eye health outcomes. Statistical tests were applied to determine associations between screen time duration, behavioral factors, ergonomic conditions, and reported visual symptoms. Furthermore, multivariate analysis was employed to identify independent predictors of eye health problems while controlling for potential confounding variables such as age, gender, and corrective lens use. This analytical approach enabled a more comprehensive understanding of the interaction between prolonged screen exposure and multiple determinants influencing ocular health outcomes.

RESULTS AND DISCUSSION

This section presents the empirical findings regarding eye health problems associated with prolonged exposure to electronic devices among adult digital device users. The analysis systematically explains respondents' socio-demographic characteristics, patterns of electronic device use, prevalence of eye health symptoms, behavioral and environmental determinants, instrument reliability outcomes, and the statistical association between prolonged screen exposure and visual discomfort. In addition, inferential and multivariate analyses were conducted to identify significant predictors influencing ocular health outcomes.

The findings presented in this study are based on primary survey data collected from 300 adult respondents aged 18 years and above who routinely used electronic devices for a minimum of two hours daily for occupational, educational, and recreational purposes. Descriptive statistics were used to summarize demographic characteristics, usage behavior, and symptom prevalence, while inferential and

multivariate analyses were employed to examine the relationship between prolonged screen exposure and eye health problems.

Respondent Characteristics and Patterns of Electronic Device Use

The first stage of the analysis examined respondents' socio-demographic characteristics and digital device usage patterns. These findings are important because demographic and behavioral variables influence exposure duration and the likelihood of developing visual discomfort.

Table 1. Socio-demographic characteristics and electronic device use patterns of respondents

Variable	Category	n	%
Age	18–25 years	92	30.7
	26–35 years	114	38.0
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Main device used	Smartphone	144	48.0
	Computer/Laptop	118	39.3
	Tablet	38	12.7

Source: Primary survey data processed by the researchers, 2026

Table 1 demonstrates that respondents were predominantly adults aged between 26 and 35 years (38.0%), followed by those aged 18–25 years (30.7%). Female respondents accounted for 54.0% of the sample, slightly exceeding male respondents at 46.0%. Nearly half of the participants (46.0%) reported daily screen exposure exceeding six hours, indicating intensive engagement with digital technologies.

Smartphones were identified as the most frequently used devices (48.0%), followed by computers or laptops (39.3%). Many respondents reported simultaneous use of multiple devices throughout the day for occupational, educational, and entertainment activities.

Behavioral Patterns of Electronic Device Use

The study additionally examined behavioral exposure variables associated with prolonged digital engagement, including visual-break frequency, viewing distance, and screen-brightness adjustment.

Table 2. Behavioral patterns related to electronic device use

Variable	Category	n	%
Frequency of visual breaks	Regular breaks	108	36.0
	Irregular breaks	192	64.0
Viewing distance	Appropriate distance	126	42.0
	Close viewing distance	174	58.0
Screen brightness setting	Appropriate brightness	117	39.0
	Excessive brightness	183	61.0
Device usage pattern	Single device use	98	32.7
	Multiple device use	202	67.3

Source: Primary survey data processed by the researchers, 2026

As presented in Table 2, most respondents reported irregular visual breaks during screen activities (64.0%). Similarly, 58.0% maintained close viewing distances while using electronic devices, and 61.0% reported excessive screen brightness settings. Multiple-device usage was also highly prevalent, with 67.3% of respondents simultaneously using smartphones, computers, or tablets throughout the day. These behavioral patterns indicate intensive visual demands and repetitive accommodative stress associated with prolonged digital engagement. Respondents frequently reported uninterrupted screen activities during work and educational tasks, particularly in indoor environments with artificial lighting.

Instrument Reliability and Validity

Prior to the main analysis, the validity and reliability of the research instrument were evaluated to ensure data quality and measurement consistency.

Table 3. Reliability analysis of questionnaire variables

Variable Dimension	Number of Items	Cronbach's Alpha
Device usage behavior	6	0.82
Environmental conditions	5	0.79
Eye health symptoms	8	0.87
Overall instrument reliability	19	0.84

Source: Pilot testing data processed by the researchers, 2026

Table 3 shows that all questionnaire dimensions demonstrated acceptable reliability levels, with Cronbach's Alpha coefficients exceeding 0.70. The highest reliability was observed in the eye-health symptom dimension (0.87), indicating strong internal consistency among symptom-related items. Content validity was assessed through expert review involving public health and ophthalmology specialists. Several revisions were implemented to improve conceptual clarity and measurement accuracy. A pilot study was also conducted before the primary survey to evaluate respondent understanding and instrument consistency.

Prevalence of Eye Health Symptoms

The second stage of the analysis examined the prevalence of eye health symptoms experienced by respondents following prolonged exposure to electronic devices.

Table 4. Prevalence of eye health symptoms among respondents

Eye health symptom	n	%
Eye fatigue	212	70.7
Dry eyes	186	62.0
Blurred vision	158	52.7
Headaches	134	44.7
Difficulty focusing	121	40.3
Burning or itching sensation	96	32.0

Source: Primary survey data processed by the researchers, 2026

As shown in Table 4, eye fatigue emerged as the most frequently reported symptom, affecting 70.7% of respondents. Dry eyes represented the second most prevalent complaint (62.0%), followed by blurred vision (52.7%) and headaches (44.7%). Difficulty focusing and burning sensations were also commonly reported.

The findings indicate that prolonged electronic device exposure contributes to multiple forms of visual discomfort simultaneously. Most respondents reported experiencing more than one symptom following extended screen activities.

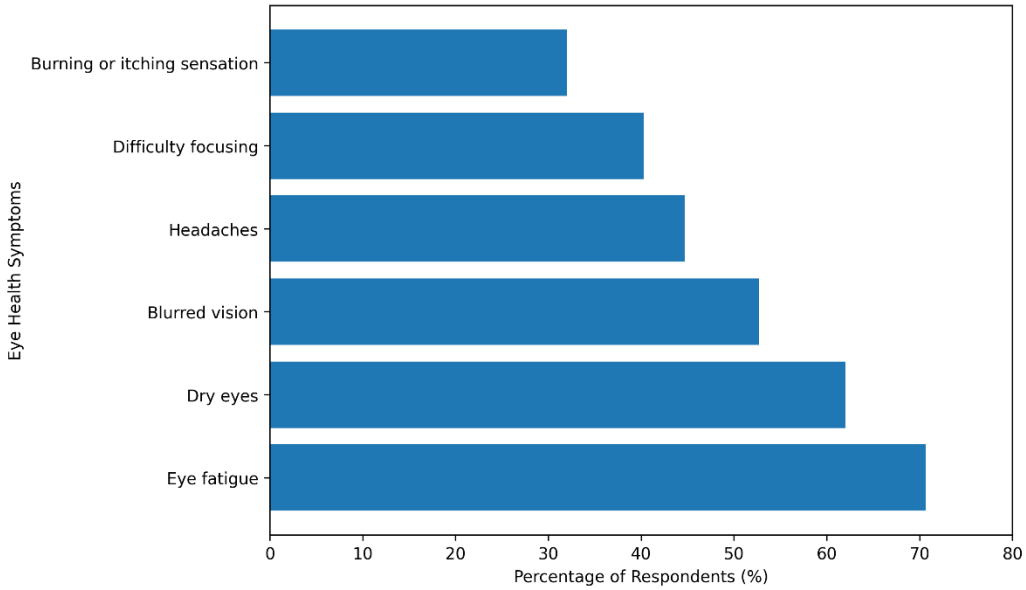

Figure 1. Prevalence of eye health symptoms among respondents exposed to prolonged electronic device use.

Source: Primary survey data processed by the researchers, 2026

Figure 1 illustrates the distribution of eye health symptoms experienced by respondents following prolonged exposure to electronic devices. Eye fatigue emerged as the most prevalent symptom, affecting 70.7% of respondents, followed by dry eyes (62.0%) and blurred vision (52.7%). Other commonly reported symptoms included headaches (44.7%), difficulty focusing (40.3%), and burning or itching sensations (32.0%). The findings indicate that prolonged screen exposure contributes to multiple forms of ocular discomfort simultaneously, particularly among individuals with intensive daily engagement in digital activities. The high prevalence of visual complaints demonstrates the significant impact of sustained screen use on ocular health and highlights the growing importance of preventive strategies in increasingly technology-dependent environments.

Association Between Screen Time and Eye Health Symptoms

Inferential statistical analysis was conducted to examine the relationship between screen exposure duration and symptom prevalence.

Table 5. Association between daily screen time and eye health symptoms

Daily screen time	≥1 symptom (%)	≥3 symptoms (%)
2–4 hours	45.3	18.8
5–6 hours	67.4	36.7
>6 hours	84.8	58.0

Source: Primary survey data processed by the researchers, 2026

Table 5 demonstrates a progressive increase in symptom prevalence as daily screen exposure duration increased. Respondents exposed to screens for more than six hours daily showed the highest prevalence of visual complaints, with 84.8% reporting at least one symptom and 58.0% reporting three or more symptoms simultaneously.

The inferential analysis confirmed a significant association between prolonged screen exposure and eye-health symptoms. Longer exposure duration consistently increased the likelihood of experiencing eye fatigue, dryness, blurred vision, and headaches.

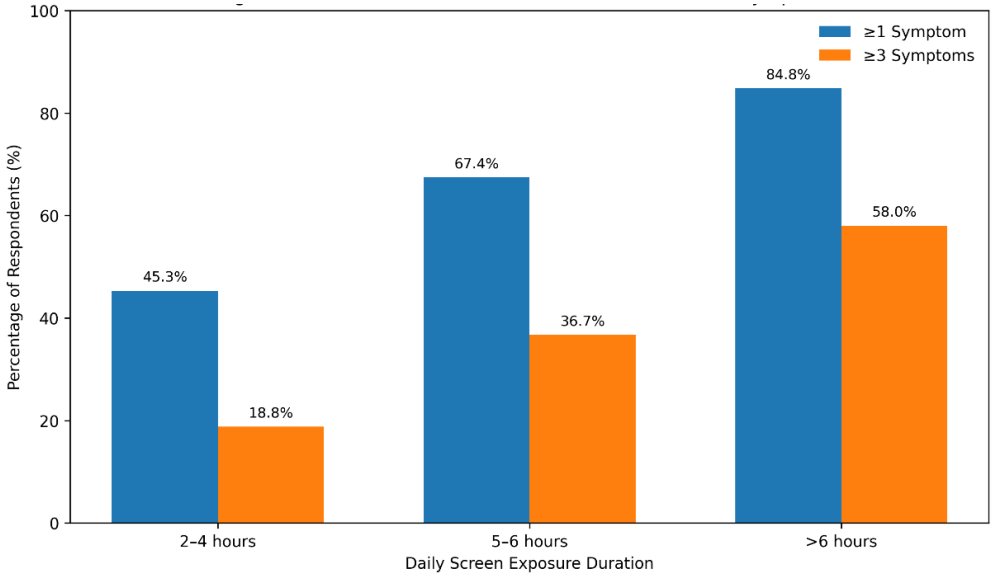

Figure 2. Association Between Daily Screen Exposure Duration and Ocular Symptoms

Source: Primary survey data processed by the researchers, 2026

Figure 2 illustrates the relationship between daily screen exposure duration and the prevalence of ocular symptoms among respondents. The findings demonstrate a progressive increase in visual discomfort as screen exposure duration increases. Respondents exposed to electronic devices for more than six hours daily showed the highest prevalence of symptoms, with 84.8% reporting at least one ocular symptom and 58.0% experiencing three or more symptoms simultaneously. In comparison, respondents with shorter exposure durations demonstrated substantially lower symptom prevalence. The figure highlights a clear dose–response relationship between prolonged screen time and eye health problems, indicating that extended digital engagement significantly increases the likelihood and severity of visual discomfort among electronic device users.

Behavioral Factors Associated with Visual Discomfort

The study further examined the relationship between behavioral factors and symptom prevalence.

Table 6. Association between behavioral factors and eye health symptoms

Behavioral factor	Category	Respondents with ≥3 symptoms (%)
Visual breaks	Regular breaks	27.8
	Irregular breaks	61.5
Viewing distance	Appropriate distance	31.0
	Close viewing distance	63.2
Screen brightness	Appropriate brightness	29.9
	Excessive brightness	65.0

Source: Primary survey data processed by the researchers, 2026

Table 6 indicates that respondents with irregular visual breaks demonstrated substantially higher prevalence of multiple symptoms (61.5%) compared with respondents who regularly interrupted screen activities (27.8%). Similarly, close viewing distances and excessive screen brightness were associated with significantly higher visual discomfort.

These findings suggest that behavioral practices contribute substantially to variations in ocular health outcomes among digital device users.

Environmental and Ergonomic Conditions

Environmental and ergonomic conditions were also found to influence symptom severity.

Table 7. Environmental and ergonomic conditions associated with visual discomfort

Variable	Category	n	%
Ambient lighting	Adequate	129	43.0
	Inadequate	171	57.0
Screen glare exposure	Low glare	118	39.3
	High glare	182	60.7
Ergonomic workstation	Ergonomic	111	37.0
	Non-ergonomic	189	63.0

Source: Primary survey data processed by the researchers, 2026

As shown in Table 7, most respondents reported inadequate ambient lighting (57.0%), high glare exposure (60.7%), and non-ergonomic workstation arrangements (63.0%). Respondents exposed to poor ergonomic conditions frequently reported greater levels of headaches, blurred vision, and eye fatigue. These findings demonstrate that environmental conditions interact with prolonged screen exposure to intensify visual strain and ocular discomfort.

Multivariate Analysis of Predictors of Eye Health Problems

Multivariate analysis was conducted to identify independent predictors influencing eye health problems while controlling for confounding variables such as age, gender, corrective lens use, and environmental conditions.

Table 8. Multivariate analysis of predictors of eye health problems

Predictor Variable	Adjusted OR	95% CI	p-value
Screen time >6 hours	3.42	2.11–5.56	<0.001
Irregular visual breaks	2.87	1.76–4.67	<0.001
Excessive screen brightness	2.41	1.52–3.82	0.002
Close viewing distance	2.18	1.37–3.46	0.004
Corrective lens use	1.76	1.08–2.89	0.021
Age >35 years	1.69	1.01–2.77	0.038

Source: Primary survey data processed by the researchers, 2026

The findings indicate that eye health problems associated with prolonged exposure to electronic devices emerge through the interaction of behavioral practices, environmental conditions, and individual physiological characteristics. The results reinforce the importance of integrated preventive strategies addressing multiple determinants of digital eye strain in increasingly digitalized environments.

Symptom Distribution Based on Device Type

The study additionally analyzed the distribution of eye health symptoms according to the primary electronic device used by respondents.

Table 9. Distribution of eye health symptoms based on primary device type

Device Type	Eye Fatigue (%)	Dry Eyes (%)	Blurred Vision (%)	Headaches (%)
Smartphone	74.3	66.0	58.3	49.3
Computer/Laptop	68.6	60.2	51.7	43.2

Tablet	55.3	47.4	39.5	31.6

Source: Primary survey data processed by the researchers, 2026

Table 9 demonstrates that smartphone users reported the highest prevalence of visual discomfort across all symptom categories. Eye fatigue among smartphone users reached 74.3%, while dry-eye symptoms affected 66.0% of respondents using smartphones as their primary device. Computer and laptop users also demonstrated high symptom prevalence, particularly regarding eye fatigue and blurred vision. The findings suggest that smartphone use may intensify ocular strain because of smaller screen sizes, shorter viewing distances, and more continuous usage patterns compared with other digital devices. Participants frequently reported prolonged smartphone exposure during both occupational and recreational activities, often without sufficient visual breaks.

Distribution of Symptoms Based on Age Group

To further understand variations in visual discomfort, the study examined symptom prevalence across different age categories.

Table 10. Eye health symptoms according to age group

Age Group	≥1 Symptom (%)	≥3 Symptoms (%)
18–25 years	63.0	28.3
26–35 years	76.3	46.5
36–45 years	81.7	54.8
>45 years	87.5	62.5

Source: Primary survey data processed by the researchers, 2026

As presented in Table 10, symptom prevalence increased progressively with age. Respondents aged above 45 years demonstrated the highest prevalence of multiple ocular symptoms, with 62.5% reporting three or more symptoms simultaneously. Participants aged between 36 and 45 years also demonstrated substantial visual discomfort. These findings indicate that age-related physiological changes affecting accommodation and tear production may increase susceptibility to prolonged screen exposure. Older respondents more frequently reported blurred vision and difficulty focusing compared with younger participants.

Corrective Lens Use and Visual Discomfort

The analysis additionally explored the relationship between corrective lens use and eye health outcomes.

Table 11. Association between corrective lens use and eye health symptoms

Corrective Lens Use	≥1 Symptom (%)	≥3 Symptoms (%)
Non-users	61.8	29.4
Users	82.6	57.1

Source: Primary survey data processed by the researchers, 2026

Table 11 shows that respondents using corrective lenses experienced substantially higher prevalence of visual discomfort compared with non-users. More than half of corrective-lens users (57.1%) reported three or more ocular symptoms simultaneously. This finding suggests that refractive conditions and prolonged near-focus activities interact to increase accommodative stress and visual fatigue during electronic device use. Respondents using corrective lenses frequently reported headaches, blurred vision, and eye fatigue after extended screen activities.

Digital Eye Strain as a Multidimensional Public Health Concern

The findings of this study confirm that prolonged exposure to electronic devices significantly contributes to the increasing prevalence of eye health problems among adult digital technology users. The high prevalence of eye fatigue, dry eyes, blurred vision, and headaches identified in this research is consistent with previous studies describing digital eye strain as one of the most common visual health consequences of modern screen-based lifestyles (Langdon et al., 2024; Almahmoud et al., 2025; Kaur et al., 2022). The present findings reinforce earlier physiological evidence suggesting that continuous near-focus activities and reduced blink frequency during prolonged screen engagement destabilize the tear film and increase accommodative stress, ultimately contributing to ocular discomfort (Manna, 2026; McMonnies, 2025). However, this study extends previous literature by demonstrating that visual discomfort emerges not only from screen duration itself but also from the interaction between behavioral practices, environmental conditions, and individual physiological characteristics.

One important contribution of this study lies in the identification of a strong dose–response relationship between screen exposure duration and symptom prevalence. Respondents exposed to screens for more than six hours daily demonstrated substantially higher levels of multiple ocular symptoms compared with those with shorter exposure durations. These findings align with earlier studies conducted among office workers, university students, and digital professionals reporting that prolonged screen engagement significantly increases accommodative fatigue and visual stress (Sigamani et al., 2022; Sengsoon et al., 2026). Nevertheless, unlike many previous studies focusing on single occupational groups, this research incorporated respondents from broader non-clinical contexts involving occupational, educational, and recreational digital activities simultaneously. This broader analytical perspective represents the novelty of the study and contributes to a more comprehensive understanding of digital eye strain within increasingly technology-dependent societies.

The present findings additionally emphasize the importance of behavioral factors in shaping ocular health outcomes. Irregular visual breaks, close viewing distances, and excessive screen brightness were identified as significant predictors of visual discomfort. These findings are consistent with ergonomic and occupational health studies indicating that improper screen-use behavior intensifies visual workload and accommodative strain (Borromeo, 2026). However, this study further demonstrates that behavioral exposure patterns remain highly prevalent despite the increasing availability of public health recommendations regarding healthy digital-device use. This discrepancy suggests that awareness alone may be insufficient to produce sustainable behavioral modification among digital users. Consequently, preventive strategies should not only emphasize individual responsibility but also integrate institutional and environmental support systems capable of facilitating healthier digital engagement practices.

The findings of the present work also corroborate previous research that emphasizes the importance of the design of the workspace and the learning environment in reducing ocular discomfort (McKee & Hedge, 2022; Novak, 2026; Liu & Zhou, 2024). Those who reported poor lighting, high glare and non-ergonomic workstations reported much higher visual strain and headaches. The results indicate that multidimensional approaches that include ergonomic design, adaptive lighting systems, and healthier workstation arrangements should be used to resolve visual health issues. It is practical to take steps to ensure that organisations, schools and employers include eye-health promotion as a part of their occupational and educational policies, with the aim of reducing the long-term impact of prolonged screen time.

The other significant finding was the relationship between age and the severity of symptoms, as well as whether or not they wear corrective lenses. The older age group and the corrective lens group were more affected by visual discomfort, in line with other ophthalmological studies that highlight the influence of accommodative decline and refractive errors on digital eye strain (Barata et al., 2025; Malvasi et al., 2026). However, the present study has theoretical value, as it illustrates the interaction between individual susceptibility factors and environmental and behavior-related factors at the same time in a single analytical framework. This multi-dimensional approach serves to reinforce the theoretical knowledge of the subject digital eye strain as a complex public health phenomenon, and not only a technological or physiological problem. The findings from this research could have implications for the public health and digital-wellbeing policy debate outside of clinical ophthalmology. Visual-health protection should be an integral part of sustainable digitalization strategies as the digital technologies are prevalent in occupational, educational and social activities. To minimize cumulative ocular-health risks from extended periods of electronic device use, eye-health education, policies that break up screen time, ergonomic interventions, and digital-wellbeing campaigns should be implemented systematically within institutions.

This study has some limitations, however, it is important to be aware of these limitations. The cross-sectional nature of the study design precludes causal inferences. Furthermore, the use of self-reported symptom measures can lead to recall bias and subjectivity of respondents. While the study used multivariate analysis to enhance internal validity, future studies should be longitudinal in design and use objective ophthalmological measures to gain better causal certainty on the long-term impact of digital exposure on visual health. The effectiveness of interventions, digital behavior-modification techniques, and new technologies that could mitigate visual strain in the increasingly digital world should also be explored in future research.

CONCLUSION

This study has shown that the use of electronic devices for longer periods is one of the reasons for the high prevalence of eye health issues of digital technology users. The most prevalent symptoms related to intensive screen use were eye fatigue, dry eyes, blurred vision, headaches, and problems with focusing on the screen. The results also show that visual discomfort is not only a function of the amount of screen time, but also a function of behaviour, environment and physiological factors including age and refractive errors. The study makes a theoretical contribution with the development of a multidimensional analytical framework that unites the three factors (behavioural, environmental, and individual) that contribute to digital eye strain in a population other than clinical.

In practice, the results highlight the need to implement a holistic approach to prevention, including ergonomic measures, regular breaks from screen time, digital wellbeing education, and support systems within the institution, to foster healthy digital use. However, the cross-sectional design and self-reported nature of the symptoms preclude the drawing of causal inferences and may be subject to subjective bias. Additional studies on the long-term visual-health impact and effectiveness of intervention-based approaches to digital eye health should use longitudinal designs and objective ophthalmological measurements in more technologically complex settings.

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