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The Effect of Digital Devices on Visual Eye Health

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الملخص: أدى الاستخدام الواسع للأجهزة الرقمية، بما في ذلك الهواتف الذكية والأجهزة اللوحية وأجهزة الكمبيوتر، إلى زيادة الشعور بعدم الراحة البصرية والأعراض العينية المرتبطة بها لدى المستخدمين. تهدف هذه الدراسة إلى فحص تأثير التعرض المطول للشاشات على صحة العين، وتحديد أكثر الأعراض شيوعًا المرتبطة بإجهاد العين الرقمي أو متلازمة رؤية الكمبيوتر. تشير الأدلة المستقاة من الدراسات الحديثة إلى أن قضاء وقت طويل أمام الشاشات يُسهم في جفاف العين، وتشوش الرؤية، وإجهاد العين، والصداع، وإجهاد التكيف البصري. كما أن العوامل البيئية، مثل الإضاءة الضعيفة وبيئة العمل غير المريحة، تزيد من حدة هذه الأعراض. ويمكن للتدابير الوقائية، بما في ذلك أخذ فترات راحة منتظمة، والجلوس بوضعية صحيحة، واستخدام إضاءة مناسبة، أن تُقلل بشكل كبير من الآثار السلبية على راحة العين.

الكلمات المفتاحية: الأجهزة الرقمية، صحة العين البصرية، إجهاد العين الرقمي، متلازمة رؤية الكمبيوتر، أعراض العين، وقت الشاشة، بيئة العمل المريحة.

Abstract: The widespread use of digital devices, including smartphones, tablets, and computers, has led to an increase in visual discomfort and related ocular symptoms among users. This study aims to examine the impact of prolonged screen exposure on visual eye health and identify the most common symptoms associated with digital eye strain (DES) or Computer Vision Syndrome (CVS). Evidence from recent studies shows that extended screen time contributes to dry eyes, blurred vision, eye fatigue, headaches, and accommodative stress. Environmental factors such as poor lighting and improper ergonomics further exacerbate these symptoms. Preventive measures, including regular breaks, correct posture, and optimized lighting, can significantly reduce the negative effects on visual comfort.

Keywords: Digital devices, Visual eye health, Digital eye strain, Computer Vision Syndrome, Ocular symptoms, Screen time, Ergonomic.

I. INTRODUCTION

Digital devices have become an essential part of daily life, including for learning, work, and entertainment. With rapid technological advancement and the increased reliance on smartphones, computers, and tablets, average daily screen time has risen significantly, specially following the COVID-19 pandemic. Prolonged screen exposure can lead to visual discomfort and eye-related problems, scientifically known as Digital Eye Strain (DES) or Computer Vision Syndrome (CVS) (Sheppard & Wolffsohn, 2018; Rosenfield, 2016).

Common symptoms include dry eyes, redness, blurred vision, burning sensation, headaches, and eye fatigue. Additionally, posture-related issues, such as neck and shoulder pain, are frequently reported (Coles-Brennan, Sulley, & Young, 2019). Reduced blink rate during screen use contributes directly to these symptoms, while prolonged near-focus effort strains the ocular muscles, causing headaches and visual discomfort (Portello, Rosenfield, & Bababekova, 2012).

Although previous studies have examined digital eye strain, there is still a gap in understanding the relationship between device usage duration and symptom severity, as well as the impact of different types of digital devices on visual health. Therefore, this study aims to assess the effect of digital device usage on visual eye health and to identify the most common symptoms associated with prolonged screen exposure.

1.1 The Main Aim:

Is to evaluate the effect of digital device usage on visual eye health and to identify the most common ocular and visual symptoms associated with prolonged screen exposure. The study also seeks to investigate the relationship between the duration of device use and the severity of these symptoms, as well as the impact of different types of digital devices on eye health.

II. LITERATURE REVIEWS

1.Rosenfield (2016):

Rosenfield conducted a comprehensive review on Computer Vision Syndrome (CVS), identifying it as a growing public health concern related to extended use of virtual gadgets which includes computers, tablets, and smartphones. The study reported that common symptoms include visual fatigue, dry eyes, headaches, blurred vision, and diplopia. The author explained that these symptoms are mainly caused by sustained near work, reduced blink rate, and increased accommodative and vergence demand. The study emphasized the importance of preventive strategies, including regular breaks, proper screen positioning, and visual ergonomics (Rosenfield, 2016).

2. Shepard & Wolffsohn (2018):

This study investigated the prevalence, assessment, and management of digital eye strain among digital device users. The authors found that a high percentage of participants experienced symptoms such as eye strain, dryness, irritation, and headaches. The study highlighted that reduced blink rate and incomplete blinking during screen use significantly contribute to dry eye symptoms. The researchers also discussed various methods to reduce digital eye strain, including visual breaks, screen filters, and appropriate refractive correction. (Shepard & Wolffsohn, 2018).

3. Logaraj *et al.* (2014):

Logaraj and colleagues examined the prevalence of computer vision syndrome among medical and engineering students. The findings indicated that over 80% of students had at least one symptom of CVS, such as ocular discomfort, erythema, a burning feeling, and cephalalgia. The study identified several contributing factors such as prolonged screen time, improper lighting conditions, poor posture, and lack of regular eye examinations. The authors concluded that awareness programs and ergonomic interventions are essential to reduce CVS among students **(**Logaraj *et al.,* 2014).

3. Portello *et al.* (2012):

This study focused on visual symptoms related to computer use among office workers. The findings demonstrated a strong association between increased daily screen time and the severity of visual discomfort, including blurred vision, eyestrain, and dryness. The authors emphasized the role of uncorrected refractive errors and poor workstation ergonomics in exacerbating symptoms. Regular eye examinations and proper workplace adjustments were recommended to minimize visual discomfort (Portello *et al.*,2012).

III. METHODOLOGY

A. This Study Design and Population:

A cross-sectional study was conducted using an online questionnaire titled “The Effect of Digital Devices on Visual Eye Health”. The questionnaire was distributed over a period of one week. A total of 70 participants, including both males and females, responded to the survey. The study aimed to assess the impact of digital device usage on visual eye health and to identify common ocular and visual symptoms among the participants.

B. Data Collection:

An online Google Forms questionnaire was used to gather the data. The questionnaire included two primary domains:
1-Demographic information: age, gender, and other relevant personal data.
2-Symptoms related to digital device use: visual and ocular symptoms such as eye strain, dryness, redness, blurred vision, and posture-related discomfort like neck and shoulder pain. The questionnaire was pre-tested for clarity and reliability before distribution. Responses were collected over a one-week period, and a total of 70 participants from both genders completed the survey.

C. Data Analysis:

The data that was collected was put into Microsoft Excel and looked at using descriptive statistic. Frequencies and percentages were calculated for categorical variables such as gender, type of device used, and presence of symptoms. Associations between the duration of digital device use and reported ocular and visual symptoms were assessed using

the Chi-square test. A p-value of much less than 0.05 turned into taken into consideration statistically significant.

IV. RESULTS

1. Demographic Characteristics:

A well-known of 70 participants completed the questionnaire. The ages of participants ranged from 14 to 46 years, with the majority being approximately 23 years old. Females constituted 64.3% of the sample, while males represented 35.7%.

Table. 1: The Demographic Data of participants:

Gender	Fr.	(%)
Male	25	35.7
Female	45	64.3
Total	70	100

2. Reported Visual and Ocular Symptoms:

the most commonly reported complaints included eye dryness, eye fatigue, blurred vision, and headaches. A considerable number of participants also noted symptoms related to prolonged near work, such as difficulty focusing and burning sensations. Additionally, some participants mentioned experiencing neck and shoulder discomfort, especially during long screen sessions. Environmental and ergonomic factors, such as poor lighting and incorrect posture, were also commonly reported among respondents.

Table 2: Common visual and ocular symptoms reported by participants:

Symptom	Reported (%)
Eye dryness	High
Eye fatigue	High
Blurred vision	Moderate–High
Headache	Moderate
Pain in Neck and shoulder	Moderate

Fig.1: The participants' ages range.

The participants' ages ranged from 14 to 46 years, with the majority being around 23 years old. Age was included as an optional question in the questionnaire, so some participants did not report their age.

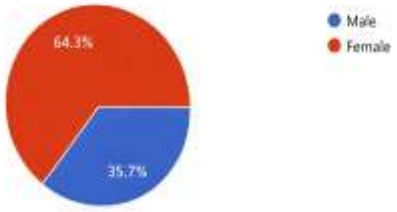

Fig 2: Gender distribution of the participants, showing that 64.3% were female and 35.7% were male.

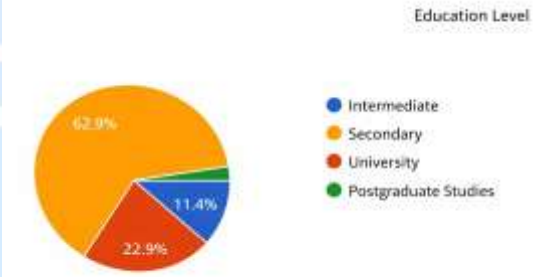

Fig 3: Education level of the participants, showing that the majority (62.9%) had a secondary education, while university graduates accounted for 22.9%.

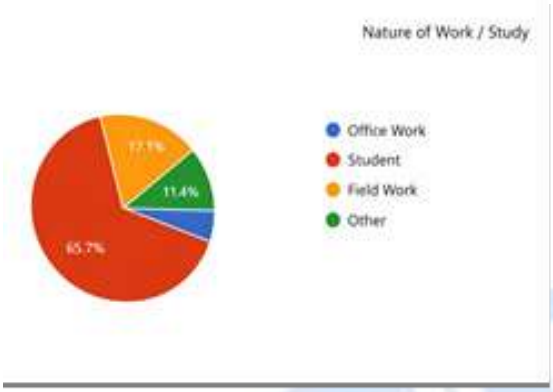

Fig 4: Distribution of participants by nature of work or study, showing that the majority (65.7%) are students, followed by field work at 17.1%.

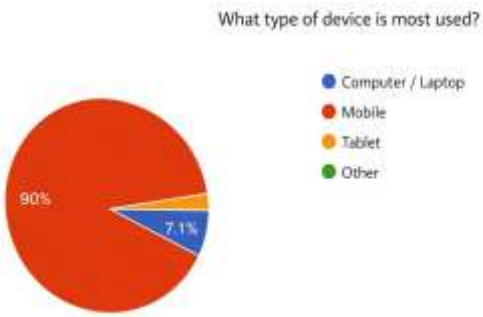

Fig 7: Types of digital devices most commonly used by participants, showing that the mobile phone is the most dominant device at 90%.

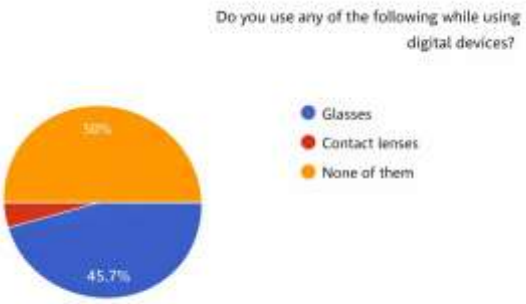

Fig 5: Use of corrective eyewear while using digital devices, showing that 50% of participants use none, while 45.7% use glasses.

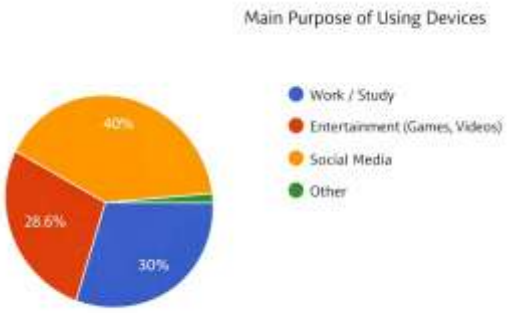

Fig 8: Main purposes for using digital devices, showing that social media is the most common reason at 40%, followed by work/study at 30% and entertainment at 28.6%.

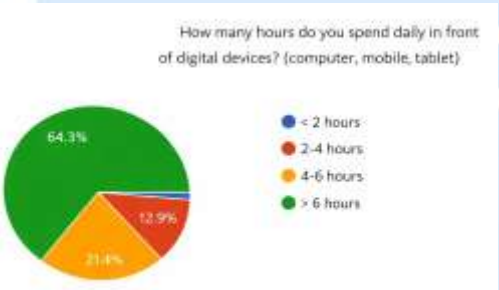

Fig 6: Daily hours spent in front of digital devices, showing that the majority of participants (64.3%) spend more than 6 hours daily, while 21.4% spend 4-6 hours.

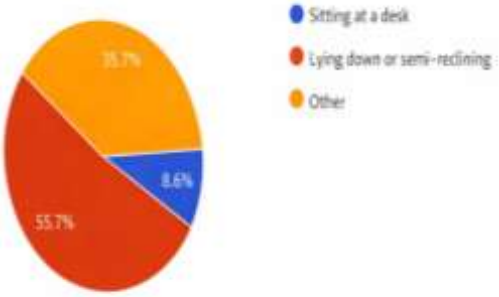

Fig 9: Physical posture while using digital devices, showing that the majority of participants (55.7%) use devices while lying down or semi-reclining.

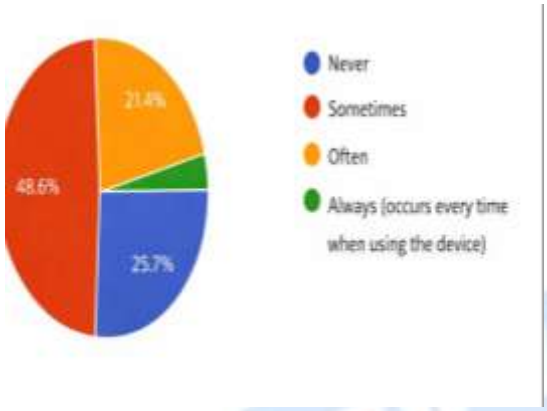

Fig 10: Frequency of burning or itching symptoms in the eyes while using digital devices, showing that nearly half of the participants (48.6%) experience these symptoms sometimes.

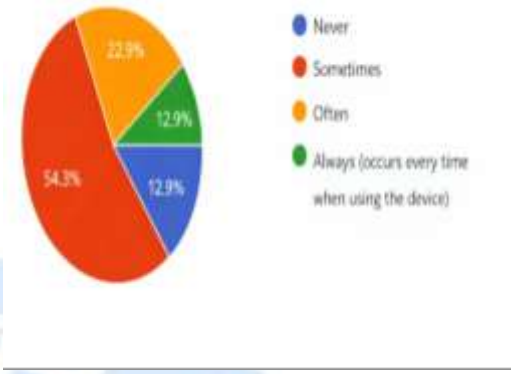

Fig. 13: Frequency of headache symptoms around the eyes or head while using digital devices, showing that more than half of the participants (54.3%) experience this symptom sometimes.

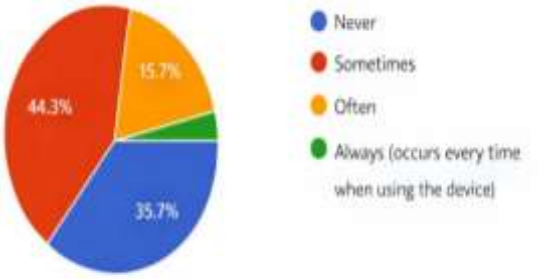

Fig 11: Frequency of dry eye symptoms while using digital devices, showing that 44.3% of participants experience it sometimes, while 35.7% never do.

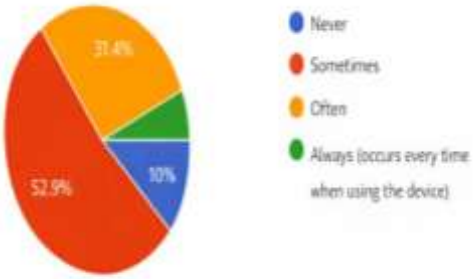

Fig. 14: Frequency of visual fatigue (eye strain) symptoms while using digital devices, showing that more than half of the participants (52.9%) experience this symptom sometimes.

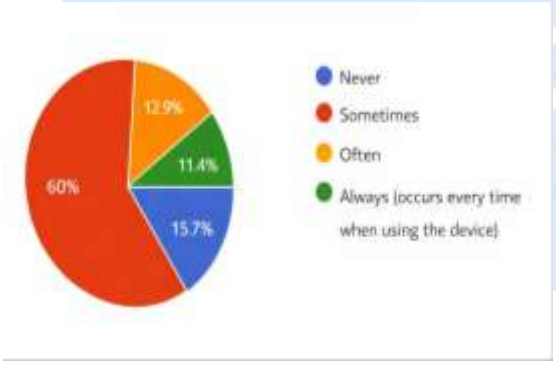

Fig. 12: Frequency of blurred vision symptoms while using digital devices, showing that the majority of participants (60%) experience this symptom sometimes.

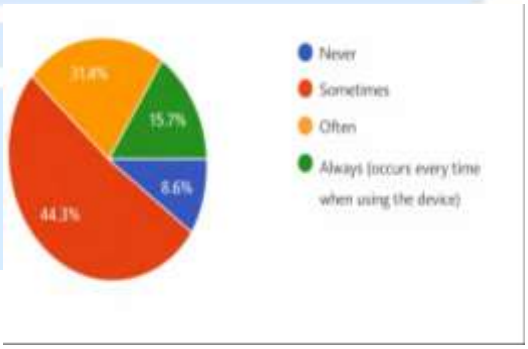

Fig. 15: Frequency of neck or shoulder pain while using digital devices, showing that 44.3% of participants experience this symptom sometimes, while 31.4% experience it often.

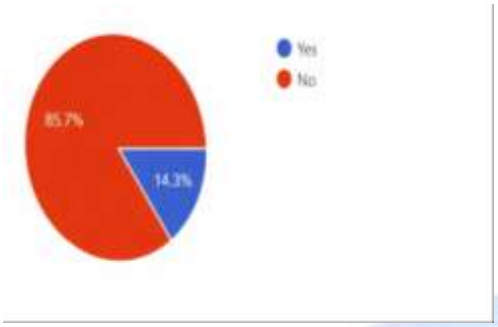

Fig. 16: Use of lubricating eye drops among participants, showing that the vast majority (85.7%) do not use them, while only 14.3% do.

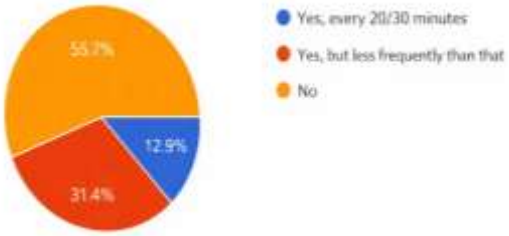

Fig 17: Frequency of taking regular breaks while using digital devices, showing that more than half of the participants (55.7%) do not take any breaks.

V. DISCUSSIONS

The findings of this study indicate that prolonged use of digital devices is associated with a high prevalence of ocular symptoms among participants, including eye strain, dry eyes, blurred vision, and headaches. These results are consistent with previous research, particularly the study conducted at Majmaah University, which reported that 49% of university students experienced dry or itchy eyes, 62% reported visual disturbances, and 79.5% suffered from neck pain because of prolonged display exposure ((Al-Hassan *et al.*, 2022).

The similarities between the current study and previous findings highlight the significant impact of extended screen time on both visual health and musculoskeletal discomfort. Factors such as improper posture, inadequate lighting, and prolonged near-focus contribute to these symptoms. These results emphasize the importance of preventive measures, including taking regular breaks, maintaining correct posture, optimizing lighting conditions, and performing eye exercises, to mitigate the negative effects of digital device use on visual and musculoskeletal health.

The results of this study indicate that prolonged use of digital devices is associated with a high prevalence of ocular symptoms among participants, including eye strain, dry eyes, blurred vision, and headaches. These findings are in agreement with a cross-sectional study conducted among university students in Hyderabad, India, where 75% of students reported headaches, 50% experienced burning or itching sensations in the eyes, and 49.1% had watery eyes due to extensive use of smartphones and laptops (Rao & Reddy, 2024).

The similarity between our findings and the Hyderabad study highlights that Digital Eye Strain (DES) is a widespread issue among university students. Both studies demonstrate that extended screen time, inadequate breaks, and poor ergonomics are key contributors to visual discomfort (Sheppard & Wolffsohn, 2018; Rosenfield, 2016; Coles-Brennan *et al.*, 2019) These results support the importance of preventive strategies, such as taking regular breaks, maintaining correct posture, optimizing lighting, and performing eye exercises, to minimize the negative impact of digital device use on visual health.

CONCLUSION

The present study demonstrates that prolonged use of digital devices is significantly associated with ocular discomfort and visual symptoms, which includes eye strain, dry eyes, blurred vision, and headaches. The findings are consistent with previous research, highlighting that extended screen time, inadequate breaks, and poor ergonomics are key contributors to Digital Eye Strain (DES) among university students. Implementing preventive strategies such as taking regular breaks, maintaining correct posture, optimizing lighting conditions, and performing eye exercises can effectively reduce the negative impact of digital device usage on visual health. These results emphasize the need for increased awareness and practical interventions to protect students' ocular health in the digital era.

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