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# VISUAL IMPAIRMENT DUE TO THE USE OF ELECTRONIC DEVICES DURING COVID-19 PANDEMI: A CROSS-SECTIONAL STUDY

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**Abstract**

Background: The world has been in a state of a pandemic for more than a year, humanity is suffering great losses. Millions of people have died, and countries have been in proper lockdowns to stay safe which has led to the greater economic and social loss. the virus that turned the world over is referred to as the SARS COV 2 virus commonly known as the coronavirus. Coronaviruses are RNA viruses that can infect animals and humans, causing respiratory and intestinal infections. SARS-CoV-2, MERS-CoV, and a new coronavirus (SARSCoV2 [2019nCoV]) are all members of the Coronaviridae family and the Beta coronavirus genus. SARSCoV2 is currently being studied in greater depth. Use of Electronic devices has shown to increased during the Pandemic, overuse has been cited as a potentially amendable risk factor that can result in visual impairment. However, reported associations between electronic devices overuse and visual impairment have been inconsistent.

Methods: This was an analytical cross-sectional study to spot light on the relationship between visual impairment and addiction to electronic devices use. Since the aim of the study was to determine the relationship between visual impairment and addiction to electronic devices use among Saudi, this is the suitable design for this research. The study was carried out among Saudi population. Data were collected from general population using questionnaire during the period from 22 August to 22 November 2020.

Results: The study included the participation of 214 participants from both genders and different age groups in the Kingdom of Saudi Arabia There were 174 female participants (81.3%) and 40 males (18.7%) took place in this study. The most prevalent age group was under the age of 40 years (n= 63, 29.4%) followed by the age group 25-35 (n= 61, 28.5%) while the least frequent age group was above 60 years (n= 1, 0.5%)On asking the participants whether they think that they have vision impairment or not, their answers were as follows: yes (n= 156, 45.3%), no (n= 58, 27.1%), Due to the use electronic devices, there were 156 participants complained of headache and eye pain. In addition, this was significantly related to the number of hours spent by study

participants using electronic devices (P= 0.002) as well as significant for female gender more than male gender (P= 0.03).
Conclusion: The study showed statistically significant relationship between the number of hours spent on using electronic devices and visual impairment among study participants especially among female population more than male population. There is a need for awareness campaigns to increase health awareness among population to cut down the use of electronic devices.

**Introduction**

Coronaviruses (CoVs) are a group of viruses that have historically been linked to mild flu-like symptoms in humans. However, the transmission of these viruses from wild animals to humans resulted in two pandemics in the last two decades: extreme acute respiratory syndrome (SARS) and middle east respiratory syndrome (MERS). The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), also known as coronavirus disease 19 (COVID19), is a recurrence of infection by SARS-related viruses that has been declared a global pandemic by the World Health Organization (WHO). SARS-CoV-2 is more contagious than prior coronaviruses and causes a more severe disease than influenza. The challenge posed by CoVs caused scientists to begin searching for therapeutics, vaccines, and diagnostics right away, resulting in laboratory contamination of animals with human or field isolates of the virus. On several occasions, the novelty of CoVs and variations in receptor binding domains of viral spike protein across different organisms proved elusive. The use of electronic devices has been increasing rapidly since their introduction in the late 2000s [1]. In 2019, the global smartphone penetration had reached approximately 41.5% of the global population [2]. Notably, the number of smartphone users in China was around 700 million in 2018, accounting for half of the Chinese population [3]. In addition, more than 80% of people in the United Kingdom owned or had ready access to a smartphone in 2019, representing a significant increase from 50% in 2012 [4]. Furthermore, more than 90% of young people between 16 and 34 years old in the United Kingdom owned a smartphone in 2019 [4].

With the continuous rise in youth digital media consumption, the incidence of ocular problems has also dramatically increased. A large portion of the population currently suffers from visual impairment, especially in Asian countries, with a rapidly increasing prevalence and younger age of onset [5-8]. It has been estimated that 49.8% (4.8 billion) and 9.8% (0.9 billion) of the global population will have myopia or high myopia by 2050 [9]. A recent study indicated that about 60 years ago, only 10%-20% of the Chinese population was nearsighted, but the percentage reached up to 90% of teenagers and young adults in 2015 [10]. Consistently, a school-based retrospective longitudinal cohort study (N=37,424 participants) found that the prevalence of myopia significantly increased from 56% in 2005 to 65% in 2015 [8].

Therefore, electronic devices overuse among children and young adults has become a matter of crucial concern [11-13]. Several studies found increased use of digital devices in children aged 2-11 years old [14,15]. For example, a study including children aged 9-11 years from 12 countries showed that 54.2% of the children exceeded proposed screen time guidelines (≤2 hours per day)

[15]. Compared with older people, children and young adults have greater risks of the undesirable consequences of electronic devices overuse because they have less self-control in electronic devices use [11]. A cross-sectional study (N=2639 participants) indicated that 22.8% of teenagers were addicted to smartphone use, which was related to hypertension [16]. Another study showed that users of mobile devices spent >20 hours weekly on email, text messages, and social networking services, indicating the heavy reliance on smartphones in their communication with other people [17]. Overall, smartphone overuse may result in significant harmful physical, psychological, and social consequences [18,19].

Some experimental studies have indicated that long-term use of a smartphone plays a key role in visual impairment, increasing the likelihood of poor vision [20-22]. For instance, a prospective clinical study (N=50 participants) showed that smartphone use for 4 hours resulted in a higher ocular surface disease index than that measured at baseline [20]. Kim et al [23] found that the increase of ocular symptoms extended to the general population, especially in adolescents, after expansion of smartphone use. However, other studies have reported the lack of evidence for such an association [24]. For example, a cross-sectional study (N=1153 participants) using stratified random cluster samples did not find a statistically significant association between smartphone use time and myopia [25]. Similarly, a study conducted in Ireland (N=418 participants) indicated that smartphone use time was not a risk factor for myopia [26]. Toh et al [27] found that smartphone use time was associated with an increased risk of visual symptoms (ie, blurring of vision, dry eye), but a decreased odds of myopia.

Despite increased concern about impaired vision due to electronic devices overuse, existing quantitative evidence about the relationships between excessive smartphone use and visual impairment remains equivocal. Therefore, it is essential to confirm and quantify whether excessive smartphone use may result in visual impairment, especially in children and young adults.

**Literature Review**

Understanding smartphone overuse and its impact on the ocular system can help the growing population of users, especially children, manage their devices in a healthier way. A systematic review of 14 studies revealed a significant association between smartphone overuse and visual impairment. However, the cross-sectional studies showed negative, but not statistically significant, associations between smartphone overuse and myopia, blurred vision and poor vision. Still, the adverse effects were more apparent in children than young adults [5-7].

The review examined 10 cross-sectional studies and four controlled trials, which included a total of 27,110 patients ranging in age from 9.5 to 26 [8].

From the cross-sectional studies, the pooled odds ratio of 1.05 suggested that smartphone overuse was not significantly associated with myopia, poor vision or blurred vision; however, these visual impairments were more apparent in children (1.06) than young adults (0.91) [9-12].

The controlled studies revealed that patients who overused smartphones displayed worse visual function scores. The pooled effect size was 0.76, which was statistically significant [13].

The researchers noted that most of the studies included in their systematic review were from Asia, which had higher prevalence rates of visual impairment even before digital devices were introduced [14].

Nevertheless, these results suggest that regulating device usage and restricting prolonged smartphone use may prevent adverse ocular and visual symptoms, especially in younger patients. The researchers recommend further research on the patterns of use, with longer follow-up on the longitudinal associations, to better inform detailed guidelines and recommendations for smartphone use in children and young adults [15].

Studies involving Internet use and individuals with visual impairments have generally focused on issues related to barriers to access and use [13-15]. Among these barriers are the difficulties associated with accessibility, cost, and assistive technology; while the perceived benefits of using the Internet include access to new information, ability to use the Internet in the workplace, and improved social participation. However, the relationship between Internet use and the psychosocial well-being of individuals with visual impairments has not yet been investigated. Initially, visually impaired people could not use mobile phones for other purposes than making calls; however, with the advent of the iPhone in 2009 and the improvement of services such as the voice over function, people with visual impairments were able to expand their mobile phone usage beyond just making phone calls. However, studies related to the use of smartphones among people with visual impairment have not been actively conducted.

**Methods**

Study design; This was an analytical cross-sectional study to spot light on the relationship between visual impairment and addiction to electronic devices use. Since the aim of the study was to determine the relationship between visual impairment and addiction to electronic devices use among Saudi, this is the suitable design for this research.

Study setting; The study was carried out among Saudi population. Data were collected from general population using questionnaire during the period from 22 August to 22 November 2020.

Sampling and sample; Participants were chosen via probability simple random sampling technique. Participants were selected from the general population. The expected number of sample size was 300 participants. However, the study included 344 participants.

Inclusion criteria: Visual impairment patients and general population, Exclusion criteria: none.

Data collection tool was self-designed and base on latest literature. It contained the following information: (1) basic information about participants and (2) disease related information.

**Statistical analysis**

Data obtained from questionnaire were entered and analyzed using SPSS program version 23 computer software. Sociodemographic data are presented using descriptive statistics as means, median, percentages and standard deviation. Independent T test and one-way Anova are used to show statistical significance among patients' characteristics and tool scores. Chi square test is used to show relationship between categorical variables. Univariate and multivariate analysis will be

performed to investigate association between gender of parents , education level and knowledge and prevent of tooth decay. statistical significance is set at a P value of 0.05 or less.

**Ethical considerations**

Administrative approval will be sought from the unit of biomedical ethics research committee Ethical approval was sought from the ethical committee of the faculty of medicine, university of Hail . An informed consent was sought from the participants.

**Results**

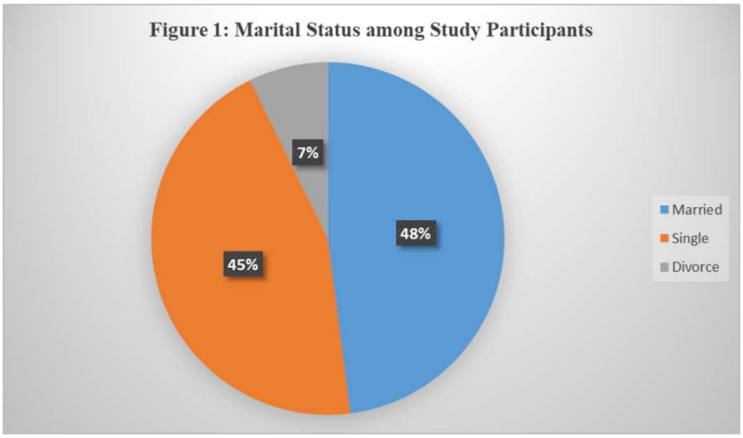
The current study aimed to examine the effect of electronic devices use and the degree of visual impairment that might occur among electronic devices users. The study included the participation of 214 participants from both genders and different age groups in the Kingdom of Saudi Arabia. There were 174 female participants (81.3%) and males (18.7%) took place in this study. The most prevalent age group was under the age of 40 years (n= 61, 28.5%) followed by the age group 21-30 (n= 49, 22.9%) while the least frequent age group was above 45 years (n= 63, 29.47%). The distribution of age groups among study participants is presented in table 1 shows the distribution of age groups by the gender of

**Table 1: Demographic Characteristics of the Participants in the Main Safety Population.**

participants. Majority of participants were Saudi (n= 160, 75.8%) and the rest of participants were non-Saudi (n= 54, 25.2%).

| **Characteristics** | Frequency | Percentage |
|---|---|---|
| Total number of responses | 214 | 100% |
| **Gender** | | |
| Female | 174 | 81.3 |
| Male | 40 | 18.7 |
| **Age Group in years** | | |
| 10-20 | 30 | 14.0 |
| 21-30 | 49 | 22.9 |
| 31-40 | 61 | 28.5 |
| 41-50 | 63 | 29.4 |
| 51-60 | 10 | 4.7 |
| 61-70 | 1 | .5 |

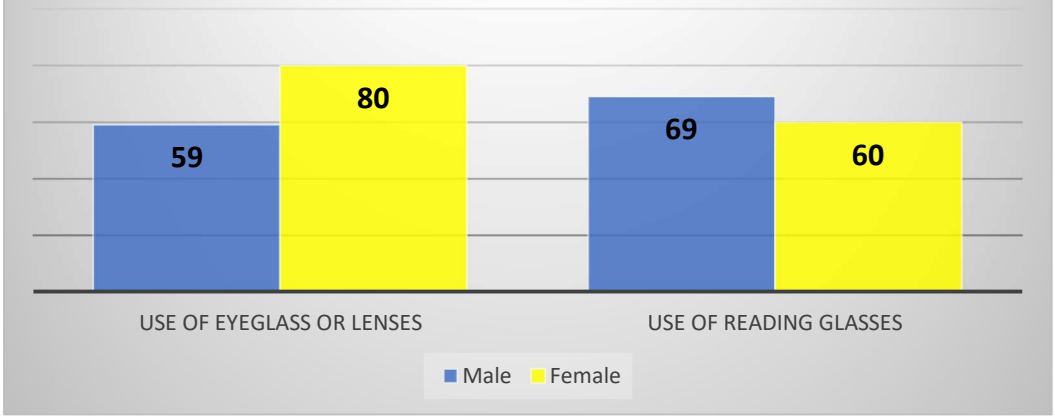
| **Education level** | | |
|---|---|---|
| Matric | 14 | 20 |
| Intermediate | 113 | 18.4 |
| University /Graduate | 326 | 53.5 |
| Postgraduate /Master | 9 | 17 |
| Nationality | | |
| Saudi | 160 | 75.8 |
| Non Saudi | 54 | 25.2 |
| Employment | | |
| working at home | 28 | 13.1 |
| Student | 48 | 22.4 |
| Unemployed | 49 | 22.9 |
| Retiree | 7 | 3.3 |
| I go to the work as usual | 79 | 45.0 |
| I have currently suspended my job | 3 | 1.4 |




The marital status of participants varied, but most of them were married ( 45%) or single ( 45.%) and Divorced were 7% . Distribution of marital status among study participants is presented in figure 1.

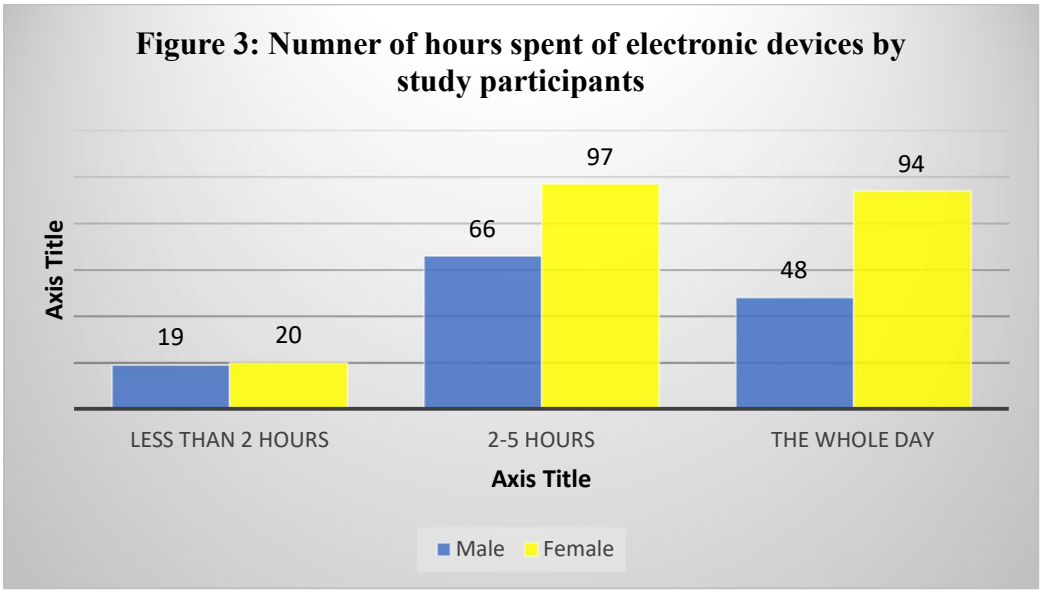
On asking the participants whether they think that they have vision impairment or not, their answers were as follows: yes (n= 156, 45.3%), no (n= 131, 38.1) and maybe (n= 57, 16.6%).

**Figure 3: Use of eyeglasses and lenses among study participants**




Participants were also asked if they wear eyeglasses or lenses. There were 139 participants used them while the rest didn't. The distribution by gender is shown in figure 3.

**Figure 3: Numner of hours spent of electronic devices by study participants**




Participants were asked if they believe that the use of electronic devices might cause vision impairment or not. Majority of them believed that use of electronic devices might cause vision impairment (n= 263, 76.5%) while the rest didn't. The number of hours spent by study participants using electronic devices is presented in figure 4.

Due to the use electronic devices, there were 107 participants complained of headache (31.1%). And this was significantly related to the number of hours spent by study participants using electronic devices (P= 0.002) as well as significant for female gender more than male gender (P= 0.03).

**Discussion**

According to a survey conducted in 2015, there are more than 1.5 billion smartphone users worldwide and, overall, more than 1 billion smartphones are estimated to have been sold [1]. Smartphone ownership was 56% in 2013 in the United States [2] and 79% in 2012 in Switzerland [3]. Based on a survey conducted in South Korea, about 9 out of 10 people own a smartphone and the usage time is steadily increasing [4]. More than 2.23 billion people use Facebook monthly, and appear to share their thoughts on social issues and details of friends through this platform [5]. In addition, more than 90% of adults in the United States visit social media websites, and in the United Kingdom people spend an average of 136 min a day on social media; such people make social comparisons through their use of social network services (SNS) and their behavior is significantly influenced by these social comparisons [6].

The 2018 Digital Information Gap Survey Report published by the National Information Society Agency (NIA) comprehensively measured the level and characteristics of the information gap occurring in the digital environment of South Korea and found that, taking the level of the general public as 100, the level of digital informatization of people with disabilities was 74.6% as of 2018. This was higher than the average (68.9%) of people with disabilities, low-income, farmers, fishermen, and the elderly, which comprised the information-vulnerable groups in the digital information gap survey and was the second highest after the low-income group (86.8%). Even relative to other groups, this information gap for people with disabilities has been increasing every year [7].

Quantitative growth and the narrowing of the gap in accessibility are the result of policy measures, such as the information and communication assistive device distribution project and development projects for people with disabilities who have difficulty accessing information due to physical and economic conditions [8-9]. The use of the Internet can provide opportunities for people with disabilities to enhance their independence, access online services such as e-banking and Internet shopping, and communicate with family and friends through e-mail or video conferencing. Through such ways, it can greatly improve their daily lives [10-11]. The Internet can be a viable way to promote social participation for people with disabilities [12] who can use information and communication assistive devices to overcome their physical limitations and to engage in socio-economic activities to expand their rights and interests [13]. Therefore, there is a need for an empirical study on how the use of digital smartphones affects the psychology of individuals, beyond the accessibility gap issue.

In recent years, with the global increase in smartphone use, studies on the relationship between this usage and emotional risk behaviors, such as depression, anxiety, and suicide-related behaviors, have been continually conducted [14-16]. Previous research on people with disabilities has

confirmed that digital use influences life satisfaction and satisfaction with policies [17-18]. In a study that investigated the relationship between social media use and well-being in people with physical disabilities, it was reported that the higher the intensity of SNS use and online community use, the lower the level of depression through intervention tools and information support. It was reported that social media use played a positive role in building social support and strong psychological tendencies [19]. In other words, there is a possibility that people with disabilities experience a positive impact on their lives through online activities.

## Conclusion

The study showed statistically significant relationship between the number of hours spent on using electronic devices and visual impairment among study participants especially among female population more than male population. There is a need for awareness campaigns to increase health awareness among population to cut down the use of electronic devices.

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