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Relationship between Visual Impairment and the Use of Electronic Devices in Kingdom of Saudi Arabia: A Cross-Sectional Study

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Overuse of electronic gadgets has been highlighted as a possible preventable risk factor for eyesight loss. Excessive use of electronic gadgets, on the other hand, has been linked to vision impairment in a variety of ways.
Methods: This was an analytical cross-sectional study to spotlight on the relationship between visual impairment and addiction to electronic devices use. The study's goal was to see if there was

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a link between Saudis' vision impairment and their addiction to using electronic devices, 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 344 participants from both genders and different age groups in the Kingdom of Saudi Arabia. There were 211 female participants (61.3%) and 133 males (38.7%) took place in this study. The most prevalent age group was under the age of 25 years (n= 111, 32.3%) followed by the age group 25-35 (n= 104, 30.2%) while the least frequent age group was above 45 years (n= 54, 15.7%). 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%). 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).

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.

Keywords: Visual impairment; electronic devices; Smartphone Overuse.

1. INTRODUCTION

Since their launch in the late 2000s, electronic device usage has risen quickly [1]. In 2019, 41.5% of the world's population possessed a smartphone [2]. In 2018, China's smartphone users were about 700 million, accounting for nearly half of the country's population [3]. In addition, in 2019, more than 80% of people in the United Kingdom owned or had ready access to a smartphone, up from 50% in 2012 [4]. Furthermore, in 2019, more than 90% of young individuals aged 16 to 34 in the United Kingdom had a smartphone [4].

The prevalence of ocular disorders has risen considerably in tandem with the continued rise in youth digital media intake. Visual impairment affects a considerable fraction of the population, particularly in Asian countries, with a rapidly increasing prevalence and younger onset age [5]. By 2050, it is anticipated that 49.8% (4.8 billion) and 9.8% (0.9 billion) of the global population will suffer from myopia or high myopia [6]. According to a recent study, just 10% to 20% of the Chinese population was nearsighted 60 years ago, but the percentage had risen to 90% of teenagers and young people in 2015 [7]. Myopia prevalence grew dramatically from 56 percent in 2005 to 65 percent in 2015, according to a school-based retrospective longitudinal cohort research (N=37,424 participants) [8].

As a result, excessive use of electronic devices among children and young adults has become a major concern [9]. Children aged 2 to 11 years old were reported to utilize digital gadgets more often in several research [10]. For example, a study of children aged 9 to 11 years old from 12 nations found that 54.2 percent of the youngsters surpassed the recommended screen usage of 2 hours per day [11]. Children and young adults, compared to older people, are more vulnerable to the negative repercussions of excessive use of electronic gadgets because they lack self-control [12]. According to a cross-sectional study with N=2639 participants, 22.8 percent of teenagers are addicted to smartphone use, which is linked to hypertension [13]. Another study found that mobile device users spend more than 20 hours per week on email, text messages, and social networking sites, showing a strong reliance on cellphones in interpersonal communication [14]. Overuse of smartphones can have serious physical, psychological, and societal effects [15].

Long-term smartphone use has been shown in several studies to have a crucial role in visual impairment, increasing the chance of poor vision [16]. For example, a prospective clinical trial (N=50 participants) found that 4 hours of smartphone use resulted in a higher ocular surface disease score than baseline [17]. After the development of smartphone use, Kim *et al* [18] discovered that the increase in ocular symptoms spread to the entire population, particularly among teens. Other research, on the other hand, have found no evidence for such a link [19]. A cross-sectional study (N=1153 participants) that used stratified random cluster

samples found no statistically significant link between smartphone use time and myopia [20]. Similarly, a study conducted in Ireland (N=418 participants) found that the amount of time spent on a smartphone was not linked to myopia [21]. Toh et al. [22] discovered that time spent using a smartphone was linked to an increased risk of visual complaints (such as blurred vision and dry eye), but a lower risk of myopia.

Despite a growing worry about vision damage caused by excessive smartphone use, quantifiable evidence on the link between excessive smartphone use and visual impairment remains ambiguous. As a result, it is crucial to assess and quantify if prolonged smartphone use, particularly in children and young adults, can lead to visual impairment.

1.1 A Significant Association between Smartphone Overuse and Visual Impairment

Understanding the effects of smartphone usage on the ocular system can assist the expanding population of smartphone users, particularly children, handle their devices in a healthier way. A systematic evaluation of 14 studies found a link between smartphone use and vision impairment. Cross-sectional research, on the other hand, found unfavorable, but not statistically significant, links between smartphone use and myopia, hazy vision, and impaired eyesight. Even still, the negative consequences were more noticeable in children than in young adults [23].

The review surveyed four controlled trials in addition to 10 cross-sectional studies, which comprised 27,110 patients ranging in age from 9.5 to 26 [8].

The pooled odds ratio of 1.05 revealed that smartphone overuse was not substantially related with myopia, impaired vision, or blurred vision in cross-sectional studies; nevertheless, these visual impairments were more noticeable 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 majority of the studies included in the systematic review were from Asia, which had greater rates of visual impairment even before the introduction of digital devices [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. To better inform precise advice and recommendations for smartphone use in children and young people, the researchers suggest more study on usage patterns, as well as longer follow-up on longitudinal associations [24].

Barriers to access and use have been the topic of many studies concerning Internet use and people with visual impairments [13, 15, 25]. Accessibility, cost, and assistive technology are among these constraints, while the perceived benefits of utilizing the Internet include fresh information, the opportunity to utilize the Internet in the workplace, and greater social involvement [26]. However, no research has been done on the link between Internet use and psychological well-being in people with visual impairments [27]. Initially, visually impaired people were unable to use mobile phones for anything other than making phone calls; however, with the introduction of the iPhone in 2009 and the advancement of services such as voice over, people with visual impairments were able to expand their mobile phone usage beyond just making phone calls [28]. However, there have been no current studies on the usage of cellphones by people with vision impairment.

2. METHODS

This research was conducted using a cross-sectional research design to assess the impact of overuse of electronic devices and vision. The cross-sectional research facilitates the researchers in measures the outcomes, as well as exposure among research participants at the same time. Cross-sectional designs are utilized for the population-based surveys, and carrying out an assessment of the prevalence of clinical complications within the sample population. Thus, the cross-sectional research design was appropriate with reference to the research aims, which was the assessment of the relationship between the use of electronic devices and visual impairment within the Saudi population.

2.1 Research Settings and Population

This research was conducted among population from different regions of Saudi Arabia. Data were collected from general population using questionnaire during the period from 22 August to 22 November 2020. The sample population for this research comprised of male and female

population. The sample population was recruited by using an inclusion and exclusion criteria. The individuals willing to participate in the research were further briefed about the research-related details, and a total of N=344 individuals were selected for this research. The study included the participation of 344 participants from both genders and different age groups in the Kingdom of Saudi Arabia. There were 211 female participants (61.3%) and 133 males (38.7%) took place in this study.

2.2 Data Collection and Data Analysis

The data collection or this research was conducted by using a questionnaire focused on the relationship between the use of electronic devices and visual impairment within the Saudi population. The consultants assessed the validity of the research questionnaire. The questionnaire comprised of the close-ended questions, and respondents were asked to return the filled questionnaires to the researchers.

The data analysis for this research was carried out by using the Statistical Package for the Social Sciences (SPSS). The statistical tests of descriptive statistics, as well as correlation analysis, were conducted for this research. The descriptive statistics determined the demographic factors, including age group, gender, as well as the nationality of the respondents. Moreover, the descriptive statistics also analyzed the clinical impacts experienced by the individuals after overusing the electronic devices.

Univariate analysis was 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.

3. 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 344 participants from both genders and different age groups in the Kingdom of Saudi Arabia. There were 211 female participants (61.3%) and 133 males (38.7%) took place in this study. The most prevalent age group was under the age of 25 years (n= 111, 32.3%) followed by the age group 25-35 (n= 104, 30.2%) while the least frequent age group was above 45 years (n= 54, 15.7%). The distribution of age groups among study participants is presented in Fig 1 and Table 1 shows the distribution of age groups by the gender of participants.

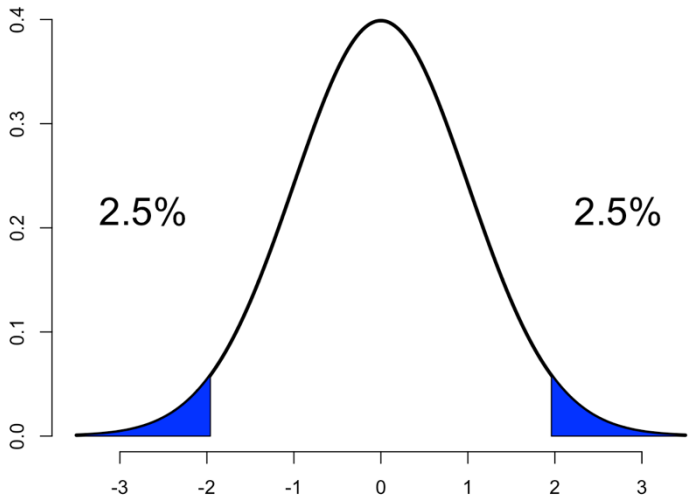

Fig. A. Statistical significance of P value

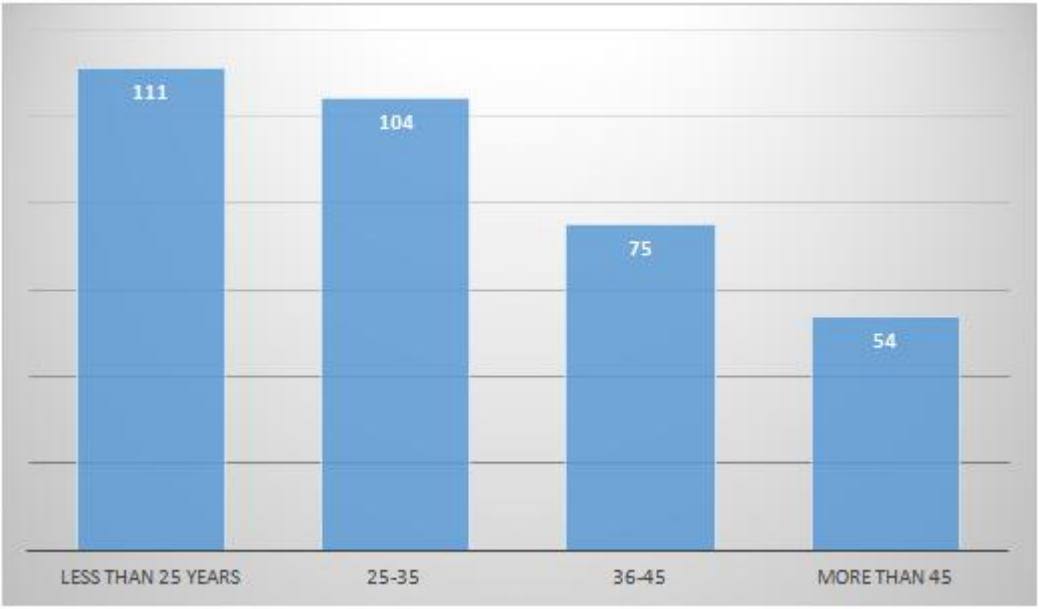

Fig. 1. Age groups distribution among study participants

Table 1. Age groups distribution according to the Gender

Age group	Male	Female
Less than 25	30	81
25-35	44	60
36-45	27	48
More than 45	32	22

The marital status of participants varied, but most of them were married (n= 165, 48%) or single (n= 154, 44.8%). Distribution of marital status among study participants is presented in Fig. 2.

Study participants were well educated. There were 197 participants had university degree (57.3%). On the other hand, small proportion attended until elementary school (n= 14, 4.1%). The educational level is demonstrated in Table 2.

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%).

Participants were also asked if they wear eyeglasses or lenses. There were 139 participants wore eyeglasses or lenses while 58 did not show their tendency to wear eyeglasses or lenses. Fig. 3 shows the gender distribution.

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 Fig 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).

4. DISCUSSION

According to a 2015 poll, there are more than 1.5 billion smartphone users globally, with more than 1 billion smartphones sold [1]. In 2013, 56 % of Americans [2] had a smartphone, compared to 79 % in 2012 in Switzerland [3]. According to a poll performed in South Korea, almost 9 out of 10 people use a smartphone, and smartphone usage is constantly expanding [4]. More than 2.23 billion individuals use Facebook on a monthly basis, and it appears that they use it to

share their opinions on social problems and personal information about their friends [5]. Furthermore, more than 90% of adults in the United States visit social media websites, and people in the United Kingdom spend an average of 136 minutes per day on social media; these people use social network services (SNS) to make social comparisons, and their behavior is significantly influenced by these social comparisons [6].

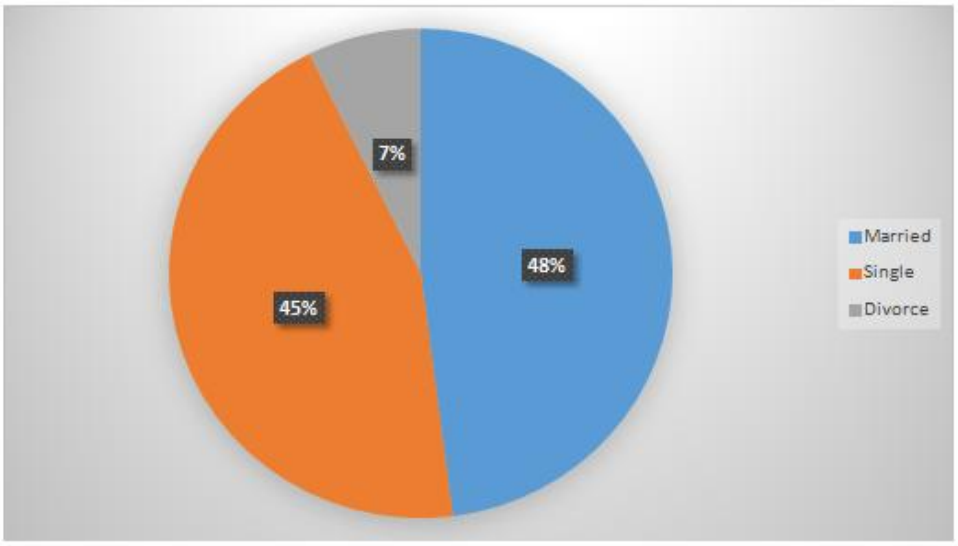

Fig. 2. Marital Status among Study Participants

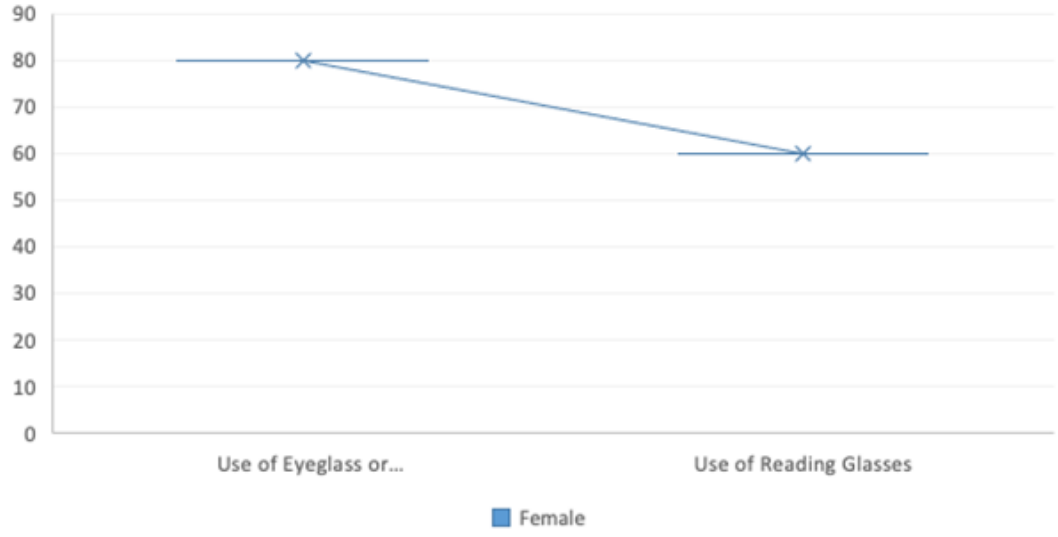

Fig. 3. Use of eyeglasses and lenses among study participants

Table 2. Educational level among study participants

Educational level	Frequency	Percent
Elementary school	14	4.1
Preparatory school	23	6.7
Secondary school	52	15.1
Community college	19	5.5
University degree	197	57.3
Higher	39	11.3

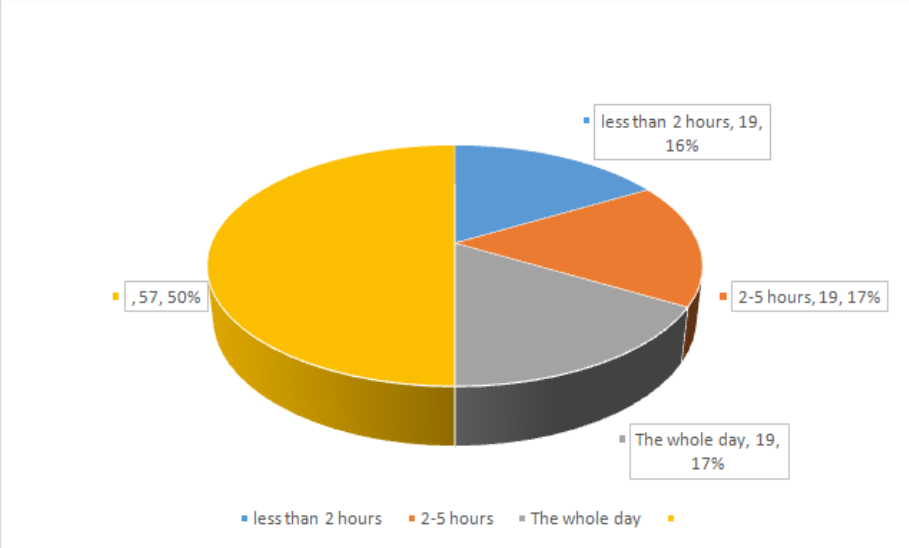

Fig. 4. Number of hours spent of electronic devices by study participants

The National Information Society Agency's (NIA) 2018 Digital Information Gap Survey Report comprehensively measured the level and characteristics of the information gap occurring in South Korea's digital environment, finding that, taking the general public's level of digital informatization as 100, the level of digital informatization of people with disabilities was 74.6 percent in 2018. This was higher than the average (68.9%) of the information-vulnerable categories in the digital information gap survey, which included individuals with disabilities, low-income, farmers, fishermen, and the elderly, and was the second highest behind the low-income group (86.8 %). This information gap for people with impairments has been growing year after year, even when compared to other groups [7].

Policy initiatives like information and communication assistive devices, which refer to equipment that help a person hear and comprehend what is being said more clearly or express thoughts more simply, have resulted in quantitative growth and a narrowing of the accessibility gap. This project aims to help people who are unable to access information due to physical or economic constraints [8-9]. People with disabilities can use the Internet to increase their independence, access online services like e-banking and shopping, and communicate with family and friends via e-mail or video conferencing. It can substantially improve their day-to-day lives in this way [10-11]. People with disabilities [12] who can use information and communication assistive technology to overcome physical restrictions and engage in socio-economic activities to broaden their rights and interests may find the Internet to be a feasible way to enhance social participation [13]. Further research into the overuse of electronic devices, the patterns of use, with longer follow-up periods to detect longitudinal associations, as well as the exact mechanisms underlying these associations, will aid in the development of detailed guidelines for electronic devices and visual impairment in the Saudi Arabian population.

Studies on the association between smartphone use and emotional risk behaviors, such as depression, anxiety, and suicide-related behaviors, have been undertaken on a regular basis in recent years [14-16], because of the global growth in smartphone use. Previous research on disabled individuals has shown that digital use has an impact on life satisfaction and policy satisfaction [17-18]. The prevalence of ocular disorders has risen considerably in tandem with the ongoing rise in youth digital media intake. Visual impairment affects a considerable fraction of the population, particularly in Asian countries, where the prevalence is quickly rising and the onset age is younger. 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 link between smartphone use and the development of ocular symptoms. Smartphone use and related ocular risks are highly suggested in health education programs.

5. CONCLUSION

Despite the fact that the statistically significant positive association between the number of hours spent using electronic devices and visual impairment was only confirmed in controlled trials and not in cross-sectional studies, the negative effect of electronic devices and visual impairment on visual functions was more apparent in females. These connections, however, must be confirmed further. Further research into the patterns of use, with longer follow-up periods to detect longitudinal relationships, as well as the exact processes underlying these associations, will aid in the development of detailed guidelines for electronic devices and visual impairment in Saudi Arabia's population. In addition, there is a need for awareness campaigns to make human beings aware of the risk that exists of losing our natural vision through an electronic device.

CONSENT AND ETHICAL APPROVAL

This research was conducted after acquiring ethical approval from the Biomedical Ethics Research Committee. Ethical approval was sought from the Ethical Committee of the Faculty of Medicine, King Abdul-Aziz University. The individuals willing to participate in the research were included in the research, and informed consent was acquired from them, prior to participation. The research participants were allowed to withdraw from the research due to any reason, without any penalty. For protecting the individuals from the risk of harm, the responses from the filled questionnaires were entered into the software.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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