Original Article

Effects of Smart Phone Overuse on Eye and Behavior

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ABSTRACT

Aim: To determine the frequency of ocular health issues, such as, digital eye strain, dry eyes, blurring of vision, and behavioral issues among individuals who report excessive smartphone use.

Study Design: Cross-sectional study.

Duration and Settings of the Study: Department of Ophthalmology of Medical Teaching Institution Khyber Teaching Hospital (MTI-KTH) from April 1, 2023, to September 30, 2023.

Methods: A total of 275 participants were enrolled using a convenience sampling technique. Participants underwent assessments related to eye health and behavioral impacts associated with smartphone overuse. Eye health effects included ocular symptoms such as eye strain assessed through self-report, dryness or watering of eyes blurring of vision, sudden blackouts, twitching of eyelids, headaches. Behavior issues included self-blame for overusing smartphone, irritability, strain, concentration issues and psychological dependency and screen time. Data analysis was conducted using SPSS version 23.

Results: Out of 275 patients 58.45% were children. The mean age of the participants was 12 ±1.5 years, Male children 32.7% appeared to be more affected by harmful eye complaints and behavioral issues than their female counterparts 25.4%. In adult patients there was evidence of mobile phone over use and addiction-like behavior higher in female 23.63% than male 18.18 %. In this study there was no statistically significant association between smart phone overuse (SMO) and blurring ($p = 0.674$) or decrease in vision ($p = 0.212$) on contrast there was statistically significant ($p < 0.005$) association between SMO and anxiety and depression.

Conclusion: Smart phone overuse poses a significant challenge to eye health and behavior among Eye OPD patients. The study emphasizes the need for comprehensive understanding and intervention strategies to address this growing issue in Pakistani society.

Key words: Anxiety, Depression, Digital eye strain, Visual Acuity, Headaches.

INTRODUCTION

The modern world is full of inventions and technologies such as televisions, Computers, mobile phones, laptops, etc. which are a great source of service, help and entertainment for mankind. Much of this has been made possible with the introduction and establishment of the internet around the globe.[1] All such inventions, of course, have various advantages, but their disadvantages are also not left behind.[1,2] A smartphone may be thought of as a handheld computer integrated within mobile telephone. Along with making calls and sending text messages, they let us browse the internet and run various software programs. Smartphones are thus an important feature of today's world.[2] While smartphone, tablet, or computer can be a hugely productive tools, compulsive use of these devices can interfere with work, school. Overuse of the smartphones can include preoccupation with mobile communication, excessive money or time spent on phones, and use of it in socially or physically inappropriate situations such as driving, walking, eating etc.[3]

In 2019, global smartphone users penetrated 41.5% of total population. Due to prolific technological advance, smartphone over use continued to be a major threat in Asian countries such as China, with around 700 million users registered in 2018.[4] In 2022, the mobile phone subscribers in Pakistan were at 175.62 million. Internet penetration in Pakistan stood at 36.5% i.e., 82.90 million internet users with 71.70

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active social media users. In Pakistan YouTube is on top with 71.70 million users, followed by Facebook with 43.55 million users.[5] The incidence of ocular problems has been greatly increased. A large portion of the population is currently suffering from visual impairment especially in our Asia continent. Hence, smartphone overuse has become a matter of crucial concern in the today's world.[6] It has negative effects on our physical and mental health, work, school, religious duties, relations etc. Virtually, all the age groups are being directly indirectly affected by its harmful and negative effects.[3]

Smartphone overuse has become a prevalent issue globally, leading to concerns about its impact on physical and mental health.[7] The study was conducted in the context of the Khyber Teaching Hospital KTH Eye OPD, where an increasing number of participants report issues potentially related to smartphone overuse. This setting provided a unique opportunity to investigate these concerns within a healthcare framework. The objective of the study is to determine the prevalence of ocular health issues, such as, digital eye strain, dry eyes, and decrease or blurring of vision, and behavioral issues among participants who report excessive smartphone use. This objective helped identify the ocular implications and potential changes in behavior associated with smartphone overuse.

METHODS

This cross-sectional study was conducted from April 1, 2023, to September 30, 2023, at outpatient (OPD) of ophthalmology department Khyber Teaching Hospital (KTH) Peshawar, Pakistan. A self-administered questionnaire was used to collect data from 275 participants, using convenience sampling technique, who attended the Khyber Teaching Hospital Eye OPD during the study period. This study included participants aged 6 to 60 years with a daily screen time of more than 1-5 hours per day on smartphones, and experiencing eye visual complaints such as digital eye strain, dry eyes, decrease, or blurring of vision, while participants with pre-existing eye diseases or systemic illnesses, those who did not provide informed consent, individuals unable to complete the self-administered questionnaire due to language barriers or cognitive impairment, those with a history of ocular trauma or surgery within the past six months, and individuals with a history of psychiatric disorders or substance abuse were excluded. The sample size of 275 participants was determined by G*power sample size calculator with type I error rate (á) = 0.05, and desired Power (1 - â) = 0.80, selected a medium effect size based on established guidelines for chi-square tests.

Data was collected within the designated eye OPD rooms of MTI-KTH. Each eye OPD room was equipped with the essential tools required for the study, where participants underwent a series of assessments related to eye health and behavioral impacts associated with smartphone overuse. At the onset of the assessment, participants were guided through a questionnaire to ascertain any prior history of visual concerns or complaints. This information was meticulously recorded alongside the participant's medical records, providing valuable contextual insights into their ocular health. These assessments encompassed various aspects of eye health, including visual acuity which was measured on Snellen chart while patient was sitting at 6-meter distance and was recorded by optometrist. Additionally, eye strain, dryness or watering of eyes, and other ocular symptoms associated with smartphone overuse, behavioral impacts such as irritability, concentration issues, anxiety, and depression were assessed by medical officer.The self-administered questionnaire covered various aspects of smartphone usage, eye health, and behavioral effects. Screening time, blurring of vision, blackout episodes, eye strain, and psychological aspects were assessed using a three-point scale (Yes, No, Sometimes). Data was saved in excel spread sheets and Data analysis was conducted using SPSS version 23, employing tools such as frequency and descriptive analysis (cross tabs), as well as the chi-square test to examine associations between smartphone overuse (SMO) and eye health issues (visual acuity, blurring of vision, decrease in vision)

and behavioral impacts (anxiety and depression).

RESULTS

Out of 275 participants, 58.4% were children between 6-16 years, with a mean age of pediatric participants was 12 ± 1.5 years. Male children 32.7% appeared to be more affected by harmful eye complaints and behavioral issues than their female counterparts 25.4%. Participants above 16 years exhibited mobile phone overuse and addiction-like behavior, with a higher prevalence in female 23.63% than male 18.18 %. Impaired control, irritability, loss of concentration, and tolerance were reported due to mobile overuse. Life-threatening effects were observed in a small percentage, such as mobile use during driving and crossing roads. In the "1-5 hours/day" daily screen time (DST) category, there were 58 participants, 20.7% of the total number of participants. In the "5-10 hours/day" (DST) category, there were 129 participants (47.5% of the total number of participants). In the "More than 10 hours/day" (DST) category, there were 88 participants, which accounts for 31.9% of the total number of participants. One hundred and sixty-two participants experienced decrease in their vision, majority fell in 6 to 10 hours daily screen time category details of participants who experienced decrease in vision (p-value= 0.212), eye strain (p=0.018), and blurring (p-value= 0.674) are presented in Table 1.

Table 1: Effects of daily screen time on vision

Characteristics		Daily screen time			Total	P-value
		1-5 hours	6-10 hours	11-15 hours		
Complaint of Decrease in Vision	Yes	35	83	44	162	0.212
	No	16	25	31	72	
	Sometimes	7	21	13	40	
	Total	58	129	88	275	
Complaint of Eye strain	Yes	25	57	43	84	0.018
	No	23	45	31	133	
	Sometimes	10	27	14	58	
	Total	58	129	88	275	
Complaint of Blurring of Vision	Yes	25	57	43	125	0.674
	No	23	45	31	99	
	Sometimes	10	27	14	50	
	Total	58	129	88	275	

Various ocular symptoms were identified among respondents in the survey such as eyelid twitching reported by the most respondents i.e. 111(40.5%). Complaint of eye strain in 84 (30.3%) of participants, redness in 71(25.9%) of participants. Additionally, dry eyes were prevalent among 140 (51.1%) of respondents. Dryness complaint was most reported in users of group 6 to 10 hours per day smart phone users, details can be seen in Table 2. In contrast, 67 (24.5%) reported excessive watering of the eyes, indicating a need for treatment.

Table 2: Dry eyes and its relation to smart phone use

Characteristics		Daily screen time			Total	P-value
		1-5 hours	6-10 hours	11-15 hours		
Complaint of Dryness of Eyes	Yes	29	60	51	140	0.001
	No	18	42	19	79	
	Sometimes	11	27	18	55	
	Total	58	129	88	275	

Notably, a significant number (n= 158; 57.45%) reported headaches, particularly in the frontal/vertex region, underscoring the importance of a holistic approach to ocular and general health assessments. The survey revealed a range of adverse effects linked to mobile overuse. Notably, substantial percentages reported disruptions in daily life, including checking mobiles during the daytime 134 (49.0%) and at rest time 79 (29.0%). Sleeping habits are also affected, with 114 (41.6%) checking their phones upon waking up, potentially influencing sleep patterns. Socially, disturbed family conversations are prevalent 156 (56.7%). Cognitive impacts include concentration problems. While safety concerns are indicated by problem “most” while eating 50(18.18%), and “least” while crossing roads 18 (6.6%), driving 11 (3.6%). Additionally, there are notable psychological consequences, such as stress when not using the smartphone 51 (18.6%), anxiety or depression 60 (21.09%). There was statistically significant ($p < 0.005$) association between SMO and anxiety and depression. These findings underscore the diverse and far-reaching implications of mobile overuse on individual`s daily lives, emphasizing the importance of addressing these issues for overall well-being.

DISCUSSION

The study revealed a high prevalence of smartphone overuse among Eye OPD participants, impacting both physical and mental well-being. Psychological dependence was prominent, affecting various aspects of daily life. Most respondents (59.1%) reported a decrease in visual acuity. This highlights the significance of decrease in vision within the population, potentially warranting further investigation into the underlying causes. In contrast to our study, a systematic review and meta-analysis involving 14 studies and 27,110 subjects aged 9.5 to 26.0 years offer a more comprehensive view. The meta-analysis suggests that prolonged smartphone use may increase the likelihood of various ocular symptoms, including myopia, asthenopia, and ocular surface disease especially in observational and experimental studies targeting smartphone overuse or addiction in children or young participants.[8] However, In this study there was no statistically significant association between smart phone over use and blurring (p-value= 0.674) or decrease in vision (p-value= 0.212), which is similar to the meta-analysis which does not find a statistically significant association between smartphone overuse and myopia, poor vision, or blurred vision.[8] Eye strain emerged as a common concern, with 83(30.3%) respondents acknowledging its presence, this finding aligns with study by Nayak at al, where an increase in the eye strain symptom score (7.07±2.84) was observed.[9]

In our study female participants (n=65; 23.63%) exhibited mobile phone overuse and addiction-like behavior, with a higher prevalence in which aligns with the study done by Kamal et al which found a higher prevalence of mobile phone dependence among females, possible influence by their greater representation and longer phone usage.[10] In contrast, a Korean study revealed a strong association between prolonged smartphone use, especially in females, and abnormal social jetlag, with post-COVID-19 exacerbating this relationship. These findings collectively underscore global concerns about smartphone use, with gender-specific patterns evident across studies.[11]

This study also found that sleeping habits were affected in 114 (41.6%) participants, who checked their phones upon waking up, potentially influencing sleep patterns. These findings aligns with a study conducted in Pakistan's Khyber Pakhtunkhwa, where 56% of female medical students experienced disrupted sleep, due to excessive mobile phone use.[12] Similar results were observed in a study in Karachi on medical students, which reported a significant correlation between mobile phone addiction and sleep disturbances i.e. 184 (46%), posing risks to physical, mental, and academic health.[13] These comparisons underscore the global issue of excessive mobile phone use impacting students' well-being across diverse regions.[10,14] Excessive smartphone use was not influenced by any interest or involvement in the lecture, indicating compulsive behavior. Finally, Li et al[15] demonstrated that individuals with an external locus of control had less control over their smartphone use and, therefore, could have more negative effects, such as poor sleep quality, lower academic achievement, and lower ratings of well-being. Insecure attachment was positively correlated with problematic smartphone use in students with unhealthy family function, but not with mother-infant bonding or maternal mental health.[16] Eichenberg, et al[17] showed an association between excessive smartphone use and an insecure attachment style in problematic adolescent users. A subsequent study reported high scores for maladaptive cognitive-emotion regulation (CER) strategies such as self-blame, blaming of others ruminating, and catastrophizing thoughts.[18] Experiential avoidance (i.e., attempts to avoid thoughts, feelings, memories, and physical sensations) has been associated with excessive smartphone use and social networking.[19] Childhood emotional maltreatment correlates with problematic smartphone use in adolescents and is mediated by body image difficulties, depression, and social anxiety.[20] Emotion regulation difficulties,

and a. higher percentage of body fat were associated with excessive smartphone use among adolescents.[21] Mahapatra showed a strong association between lack of self-regulation and loneliness on problematic smartphone use among adolescents, which ultimately resulted in family, interpersonal conflicts, and poor academic performance.[22] Among students, problematic smartphone users have shown high measures of worry and anger.[23] Whereas excessive reassurance seeking behavior mediates the association between rumination and problematic smartphone use.[24] Poor communication skills were observed in medical students who preferred to communicate emotions through texting rather than verbal communication, and they correlated with excessive smartphone use. Excessive smartphone use has negative impacts on people's lives by reducing face-to-face interactions and increasing loneliness.[25]

One of the limitations of the current study is that because it was conducted in one hospital OPD, the results cannot be generalized. While our study provides valuable insights, reliance on self-reported data susceptible to biases. Additionally, the cross-sectional design limits causal inference. Future research should employ longitudinal designs to explore causal relationships and include more diverse participant samples to enhance generalizability. It is recommended to educate the participants and parents about responsible smartphone use, encouraging the use of books for academic purpose, promoting increased font size and decreased screen brightness, use of anti-reflective coated glasses and well-lit rooms, and awareness campaigns to reduce smartphone use while driving or crossing roads.

CONCLUSION

Significant prevalence of ocular symptoms such as digital eye strain and dry eyes, coupled with behavioral issues like irritability and anxiety, underscores the urgent need for intervention strategies. Education and awareness campaigns promoting responsible smartphone use, are essential to mitigate these negative effects and safeguard the well-being of individuals in Pakistani society.

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