

Smartphone Use and its Impact on Ocular Health among University Students in Saudi Arabia

Abstract

Background: People are increasingly using mobile phones rather than fixed telephones. Nearly everyone has a mobile phone and the vast majority of these are smartphone. The patterns of smartphone activities may put a significant number of populations especially students at risk of negative ocular problems. To determine the prevalence, pattern, and impact of smartphone use on ocular health among University students. **Methods:** A cross-sectional study was conducted and 760 male and female students were selected from Medical and Pharmacy Colleges by multistage random sampling. A self-administered structured questionnaire including sociodemographic and visual manifestations data was used to collect data. SPSS program version 22 was used to analyze data. **Results:** Out of 760 students selected, 546 (71.8%) responded. The overall prevalence of smartphone use was 90.84%. However, the age range for the beginning of smartphone use was 12–18 years old (68.3%). In addition, the daily duration of smartphone use was 4–6 h/day (30.2%). Furthermore, females believed that they use smartphone more than usual compared to males. Moreover, ocular pain and/or dryness after prolonged time spent on smartphone use were more among smartphone users (39.7%). Finally, most of the students (66.0%) had one or more ocular problems after smartphone use. **Conclusions:** There is an association between smartphone use and occurrence of ocular manifestations. Health education programs on smartphone use and its ocular hazards are highly recommended.

Keywords: Smartphone, students, Saudi Arabia, universities

Introduction

Smartphone is considered an important communication tool and is now becoming an integral part of our communities as it is not only a communication device but it is also a necessary social supplement.^[1] Currently, smartphones are used very frequently on a daily basis among all age groups especially adolescents and young adults.^[2] In addition, these devices can perform an increasing number of functions and tasks. Hence, their use is spreading widely all over the world compared to conventional fixed phones.^[3] Although the smartphone use all along the day can make life much easier, they can cause auditory, ocular, joint, and neurological disorders.^[4]

Abuse, and sometimes addiction of smartphone can cause physiological health problems such as headaches, eye dryness, earache, fatigue, in addition to musculoskeletal manifestations.^[5] Moreover, using smartphone during driving is the

major cause of road accidents. In addition, there are some debates on the correlation between overuse of the smartphone and cancer.^[6]

On a psychological level, smartphone addicts can cause serious psychological disorders. However, they do not have any apparent physical or psychological manifestations and their disorders are unnoticed by others.^[7]

Recently, it has been reported that the eye is the most affected organ from the use of a smartphone. However, there is scarcity of data on about the impact of smartphone on eyes in medical literature.^[8] Visual disorders are a global challenge that affects different age groups and have a major influence on national economic and financial impact.^[9] Data showed that in 2010, 285 million people all over the world suffered from visual disorders; out of these, 39 million were totally blind and 246 million had reduced vision. Almost 90% of them were from developing countries.^[10]

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Lotfi F. Issa^{1,2},
Khaled A.
Alqurashi³,
Talal Althomali⁴,
Talal A. Alzahrani³,
Abdullah
S. Aljuaid³,
Tariq M. Alharthi³

¹Department of Family and Community Medicine, College of Medicine, Taif University, ²College of Medicine, Taif University, ³College of Medicine, Taif University, ⁴Department of Ophthalmology, College of Medicine, Taif University, Saudi Arabia, ²Department of Public Health and Community Medicine, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

Address for correspondence:
Dr. Lotfi F. Issa,
College of Medicine, Taif
University, Taif, Saudi Arabia.
Faculty of Medicine, Al-Azhar
University, Cairo, Egypt.
E-mail: lotfyissa@hotmail.com

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International reports on ocular health revealed that dry eye and diplopia are the most common ocular disorders caused by smartphone and computers overuse especially in young adults who are considered the most frequent users of these devices.^[11] Therefore, some organizations have recommended the allowed duration per day to use these devices safely.

However, published data on the factors and prevalence of ocular disorders due to smartphone use is very limited especially in the Middle East area, specifically the Gulf region.^[12] Identification and better understanding of the prevalence, pattern, and the impacts of smartphone uses on ocular health among university students are the essential steps to plan and implement prevention program for decreasing the impact of smartphone use among university students and their families. Therefore, this study was conducted to explore the prevalence, pattern of use, and the impacts of smartphone uses on ocular health among university students, as representative of young adults and adolescents, in Saudi Arabia.

Methods

Study setting

The study was conducted in Taif University, which is a large sized and a public University located in Taif in the Western region of Saudi Arabia and consist of thirteen colleges. The study was carried out during the period from 1st of November 2018 to the end of February 2019.

Subjects of the study

Male and female university students from different colleges were included in the study to detect the predetermined objectives.

Study design

A cross-sectional survey was carried out on the participated college students in order to find out the predetermined objectives.

Study sample and participants

A multistage random sample was carried out to recruit the participants of the study as follow:

First stage

Two colleges were selected out of thirteen colleges by using a simple random sample.

Second stage

One academic year from the first, second, third and fourth academic years in each college was randomly selected by simple random sample.

Third stage

All students in the academic year selected were included in the study.

The Colleges of Medicine and Pharmacy were chosen according to the methods of sampling above and all students in fourth year were chosen from each college (the fourth year in the College of Medicine includes the fourth, fifth, and sixth studying years (clinical years), while the fourth year in the College of Pharmacy includes the fourth and fifth studying years (clinical years). The total number of students in the clinical years of Medical College was 300 males and 210 females, while in Pharmacy College was 150 males and 100 females.

Data collections and tools

The purposes of the study were explained by the researchers to all students included in the study. All students included in the study were interviewed personally and asked to fill the self-administered structured questionnaire after initial training, which means training the students participating in the study how to fill the questionnaire and explaining difficulties to avoid any mistake.

The self-administered structured questionnaire was developed, pretested, and validated in a pilot study. The questionnaire was including the following sections:

Section A: included questions on sociodemographic data comprising: age, sex, residence, faculty, academic grade, and per capita family monthly income in Saudi Riyal.

Section B: included questions on smartphone (usage, age at which he\she started using, duration of use\day, places of use, and purposes of use).

Section C: included questions on the eye problems (occurrence, eye problems he\she feels, how many times he\she feel the eye problems, time between the occurrence of eye disorder and the last time of using smartphone, and vision problem before and after using of smartphone).

Statistical analysis

IBM SPSS (Statistical Package for the Social Science; IBM Corp, Armonk, NY, USA) was used to perform all statistical calculations, version 22 for Microsoft Windows. Data were represented in terms of frequencies and valid percentages for continuous variables. Mean, standard deviations (SD), and minimum and maximum values were used to describe numerical variable in order to determine the prevalence of visual disorders. Chi-square test was used to compare categorical variables (cross tabulation). All *P* values <0.05 were considered statistically significant.

Ethical considerations

Deanship of student affairs' approval of the university in addition to approval of the deanship of each college was obtained before the beginning of the study. During the study, each recruited student was informed about the study objectives confirming on the confidentiality of collected data. A verbal consent was also obtained from each subject.

Results

The present cross-sectional study recruited 760 students of both genders. The total number of students in clinical years of Medical College was 300 males and 210 females, while in Pharmacy College 150 males and 100 females. Only 546 (71.8%) students completed the survey, although at the beginning of the study and before starting to collect data, a verbal consent was taken from all participants to share in the study. However, when starting to collect data, 28.2% of the students refused to share in the study without expressing any reasons for that (not willing to share in the study). Students recruited from medical college (55.3%) were more than students recruited from Pharmacy College.

Demographic data and students characteristics

Out of 760 male and female recruited students, 546 students (71.8%) responded. The majority of responding students (55.3%) were males from Medical College. The students of Medical College participated were 57.7%. The mean age of the participants was 22.2 ± 1.2 years old. In addition, the majority of participants were of high family monthly income (71.4%) [Table 1].

Furthermore, the majority of participant students were in the age group 23–25 years old (58.4%) [Figure 1].

Most students participated in the study were fifth year students (42.1%), followed by fourth year students (37.8%) [Figure 2].

Table 1. Socio-demographic characteristics of study sample

Variables	*n	%
Gender:		
Males	302	55.3
Females	244	44.7
College:		
Medicine	315	57.7
Pharmacy	231	42.3
Family monthly income:		
<5000 SR	30	5.5
5000-<10000 SR	126	23.1
10000 SR or more	390	71.4

*n=number of studied students

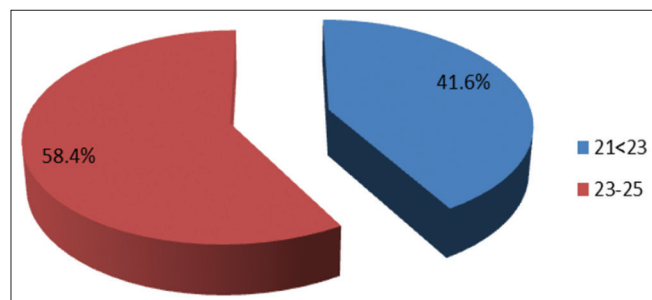


Figure 1: Age group variation of participant students of study sample. Pie, mean percent: 58.4% were in the age group 23–25 years old

Smartphone use compared over both genders

By surveying the recruited students, it was found that 496 (90.84%) of students were smartphone users. The prevalence of smartphone use was found to be higher among females compared to males (91.8% and 90.1%, respectively), though this variation was statistically insignificant (P -value = 0.48) [Table 2].

Turning to the age of using smartphones, most of the recruited subjects started using smartphone at an age range between 12 and 18 years old. It is worth to mention that females were significantly using smartphones earlier than males (68.3% and 59.6%, respectively) with P value < 0.001 [Table 2].

Daily duration of smartphone use

The average daily duration of smartphones use was found to be between 4 and 6 h, where the duration tended to increase in males compared to females (30.2% and 27.2%, respectively); however, the difference was statistically insignificant with P value = 0.44. In addition, more females felt that they are using smartphones for more time than it should be used concerning comparing feeling of using smartphone more time than expected between male and female, and it was found to be higher among female but with insignificant statistical difference (P -value = 0.29) [Table 2].

Purpose of smartphone use

It was revealed from the surveys that the use of smartphone was multipurpose in both males and females while males were using smartphones significantly more than females (52.2% and 43.8%, respectively) for different applications with a P value = 0.035 [Table 2].

Places of smartphones used

Smartphones were used by recruited students almost everywhere (home, places of study), where more females use smartphones in different places compared to males (73.2% and 72.1%, respectively), with an insignificant difference (P -value > 0.05) [Table 2].

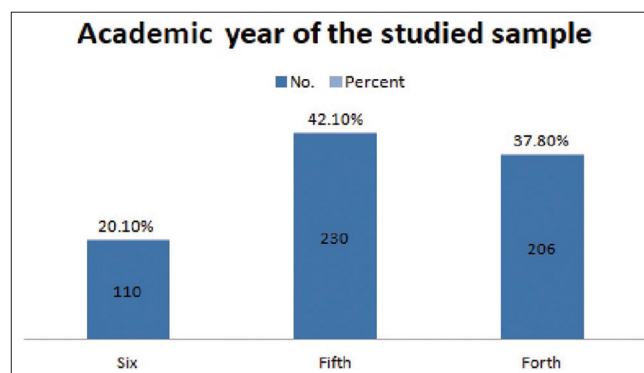


Figure 2: Academic year variation of participant students of study sample. Bars, mean percent: 37.7% were fifth year students

Table 2. Association between pattern of smart phone use and gender of participants

Variables	Gender				*P
	Male		Female		
	*n	%	n	%	
Smart Phone Use: (546)					
No.	30	9.9	20	8.2	0.48
Yes	272	90.1	224	91.8	
Age of starting use smart phone: (496)					
<6 years old	10	3.7	4	1.8	0.00
6-<12 years old	73	26.8	19	8.5	
12-<18 years old	162	59.6	153	68.3	
≥18 years old	27	9.9	48	21.4	
How long do you spend on smart phone every day? (496)					
<2 hours	19	6.9	13	5.8	0.44
2-<4 hours	67	24.6	45	20.1	
4-<6 hours	82	30.2	61	27.2	
6-<8 hours	51	18.8	56	25.0	
8 hours or more	53	19.5	49	21.9	
Purposes of use of smart phone: (496)					
Entertainment	22	8.1	12	5.4	0.035
Chatting	46	16.9	33	14.7	
Communications	17	6.3	15	6.7	
Searching	25	9.2	33	14.7	
Read Newspaper and books	20	7.4	33	14.7	
All	142	52.2	98	43.8	
Places of smart phone use: (496)					
Home	49	18.0	41	18.3	0.65
Places of study or work	18	6.6	9	4.0	
Means of transportations	9	3.3	10	4.5	
All	196	72.1	164	73.2	
Do you feel are using smart phone more time than expected? (496)					
Yes	202	74.3	179	79.9	0.29
No.	70	25.7	45	20.1	

*n=number of studied students - *P is significant if >0.05

Ocular disorders with long time spent on smartphones

A sensation of eye dryness was surveyed among the recruited students. Smartphone users (39.7%) have higher rates of eye pain and dryness when they spent prolonged time using their phones compared to nonusers (38%) but the difference was insignificant with P value = 0.8. It is important to mention that most of the smartphone users who had this problem described the frequency of its occurrence as “sometimes” [Table 3].

Ocular symptoms during smartphone use

Furthermore, the description of ocular symptoms was also included. While using smartphones, more than half of the students (66.0%) had one or more ocular symptoms such as lacrimation, itching, redness, etc., Although there was

no statistically significant difference between users and nonusers with P value = 0.7 [Table 3].

Vision disorders and size of the problem

Students were also surveyed about their opinion regarding their vision disorder and if the smartphone use influenced their ocular health. 36% of smartphone users mentioned that their ocular symptoms start directly after using smartphone where 50% of them thought the most common ocular problem they are getting is myopia and 58% of the users think that their ocular manifestations are not increased due to smartphone use. All the differences in responses between smartphone users and nonusers came insignificantly different with P value >0.05 [Table 3].

Table 3. Association between smart phone use and eye problems

Variables	Smart phone use				*P		
	No	*N	%	Yes		N	%
Have you ever felt pain or dryness of the eye because you spend a lot of time on the smart phone? (546)							
No.	16		32.0	148		29.8	0.8
Yes, daily	1		2.0	22		4.4	
Yes, sometimes	19		38.0	197		39.7	
Yes, rarely	14		28.0	129		26.0	
Do you have eye problems when using Smart Phone?(546)							
Lacrimation	3		6.0	44		8.9	0.7
Itching	7		14.0	66		13.3	
Redness	13		26.0	87		17.5	
Blurring Vision	4		8.0	64		12.9	
Visual disturbance	2		4.0	20		4.0	
Double vision	1		2.0	6		1.2	
Inflammation of the eye (allergy)	5		10.0	38		7.7	
Have no problem	15		30.0	170		34.3	
How many times do you feel this problem after smart phone use? (546)							
Have not problem							
Always	15		30.0	170		34.3	
Much	1		2.0	17		3.4	
Sometimes	5		10.0	64		12.9	
Rarely	24		48.0	191		38.5	
How long have you finished your smart phone to cause the problem? (546)							
Have not problem							0.6
Directly							
After half an hour	15		30.0	170		34.3	
Half to one hour	18		36.0	158		31.9	
One-two hours	5		10.0	48		9.7	
2-4 hours	5		10.0	25		5.0	
≥6 hours	2		4.0	39		7.9	
	2		4.0	35		7.1	
	3		6.0	21		4.2	
What are the vision problem do you feel? (546)							
Myope	25		50.0	257		51.8	0.1
Hypermetrope	18		36.0	201		40.5	
Astigmatism	6		12.0	21		4.2	
Don't Know	1		2.0	17		3.4	
Is the problem increased with the use of smart phone?							
Yes	21		42.0	195		39.3	
No.	29		58.0	301		60.7	

Discussion

Overuse of smartphone can have a drastic influence on ocular health. The present work investigated the prevalence and pattern of smartphone use among university students as well as its impact on ocular health in Saudi Arabia. The

study surveyed 760 students, of which, 546 completed the survey. The study revealed that females use smartphone more than males. On the contrary, males started using smartphone at an earlier age compared to females. Most of the surveyed students use smartphone between 4 and 6 h a day, where the duration tends to be longer for males.

Turning to visual disturbances accompanying smartphone use, it was found that ocular pain and dryness were more prevalent in smartphone users especially on spending long duration using the devices. In addition, the most common ocular manifestation was eye redness.

Other Saudi studies have also investigated the hazards of smartphone in different settings. For instance, some studies investigated the impact of electronic devices in general on female students of nursing college in Saudi Arabia regarding their health, sociability in addition to their dependence. This cross-sectional study concluded that most of the included students who were using visual contents were mainly complaining of headaches. However, the small sample size of the study, which constituted only 171 surveys, limited its findings.^[13]

In our work, surveyed students were selected randomly from both colleges of medicine and pharmacy. We surveyed 760 students while only 546 students responded optimally to the survey. Furthermore, our study focused on ocular disorders related to smartphones particularly not all electronic devices. The present work also correlated the visual problems with excessive use of smartphones, where eye redness was the most annoying problem.

Another powerful Saudi study focused mainly on the use of mobile phones and the related visual and auditory manifestation. The study surveyed 873 volunteer Saudi subjects in Riyadh with a mean age of 25.56 years old. The study concluded that the electromagnetic fields produced by mobile phones can be associated with visual, auditory, and neurological hazards, though this correlation was statistically nonsignificant. Furthermore, the study failed to find a correlation between the duration of mobile phone usage and visual disturbances.^[14]

In our study, only visual symptoms were assessed and the mean age of subjects was 22 years old. In addition, eye redness was correlated with prolonged use of smartphones though the correlation was statistically nonsignificant.

College students are not under the spot in Saudi Arabia only, but in India as well. Some studies examined various health symptoms in college students in the Indian population due to the use of smartphones. The study included students with an age range of 17 to 23 years old. The main symptoms evaluated were headache, lack of concentration, irritability, anxiety, lack of sleep, exhaustion, eye strain, and fatigue. The most common symptom was headache which occurred in half of the subjects surveyed, while visual symptoms came in the fifth rank.^[15]

In our study, only visual symptoms were evaluated in addition to figures of smartphone use. Our subjects were also college students in Saudi Arabia at almost the same age group. However, only visual symptoms were examined extensively as mentioned previously.

Finally, our study had some limitations that need to be considered in future studies; data collection was performed through a self-administered questionnaire which can put the study at the risk of recall bias or missing data. In addition, some of the variables were estimated subjectively as it was difficult to be estimated objectively like daily duration of smartphone use.

Covclusions

In conclusion, the wide applications of smartphone increased the frequency of its use in university students. This can be referred to the dramatic lifestyle changes among students in Saudi Arabia. The present study revealed that smartphones play an important role in the daily life of university students. The most important factors that increased the use of smartphone among university students were increasing availability of smartphones and the duration of smartphones contact hours. Finally, the occurrence and incidence of visual disorders were directly related to smartphone use.

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Conflicts of interest

There are no conflicts of interest.

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