



Cellphone Vision Syndrome: The Invisible Killer

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ABSTRACT

Cell phone vision syndrome is also known as digital eye strain, it is a group of vision related disorders occurring due to prolonged usage of any digital device such as computer, cell phone, tablet and e-reader. There is a need to find out the prevalence of this disorder along with its initial symptoms, due to which a person can realize the fact that he or she is suffering from cell phone vision syndrome. The aim of current study was to investigate the prevalence of cell phone vision syndrome, its symptoms and associated risk factors among private and public sector medical and dental students of Karachi. A cross-sectional prospective study was conducted in private and public sector medical and dental colleges of Karachi from January 2019 to September 2019. The data has been collected through a set of questionnaire, which was pre-designed. The data was entered into the Statistical Package for the Social Sciences (SPSS) version 22. The mean age of the participants was 21.2 ± 1.82 years. About 78.25% students were having symptoms of cell phone vision syndrome and the most common associated risk factors among them were number of hours spending on digital screen, using screen in dark room and blue light filter in screen (p -value ≤ 0.05). Respondents complained of varying degree of headache and or migraine pain in neck, shoulder or back and fatigue with 39.75%, 36% and 25.25% respectively. About 17.25% were having different degrees of blurring of the vision while 24.25% having eyestrain, 9.5% having dry eyes, 10.75% having eye redness and irritation, 9% having difficulty in refocusing eyes and 5% complained of having double vision during or after extended use of mobile phones. It has been concluding that majority of the students prefer using cell phones in the colleges and in their daily life activities which results in the deterioration of their health conditions along with impacting their quality of life.

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Authors' Contribution

KK designed the study. AR and SLF performed the statistical analysis, developed the protocol and wrote the first draft of the manuscript. GNP and LF helped in statistical analyses of the study, while AM helped in literature searches. All authors read and approved the final manuscript.

Key words

Cellphone vision syndrome, Eye strain, Blurred vision

INTRODUCTION

Usage of cell phones is increased in college students around the world, the same problem is also seen in colleges of Karachi where students waste majority of their time on cell phone devices. This enhanced usage is not only wasting their precious time of studies, but have negative impacts on health of these users as well (De-Sola Gutiérrez *et al.*, 2016; Rosen *et al.*, 2016). There are many fatal diseases which can happen because of excess use of cell phone devices for example, the international agency for research on cancer concluded that there are hazardous radiations which are emitted from cell phones, and these

radiations are one of the possible cause of increasing presentations of brain cancer (Moradi *et al.*, 2016). Lissak (2018) have reported that myopic astigmatism and myopia is a possible outcome of use of digital gadgets. One of the most prevailing problems which occur due to enhanced usage of mobile phones is cell phone vision syndrome (Sadagopan *et al.*, 2017).

Cell phone vision syndrome is also known as digital eye strain, is basically a group of vision related disorder which occur in human beings due to prolonged usage of any digital display device such as computer, cell phone, tablet and e-reader (Sheppard and Wolffsohn, 2018). It is a common disorder which occurs in many users which have a habit of using display devices for prolonged time period in their daily routine. The symptoms of cell phone vision syndrome are eye strain, headache, blurred vision, dry eyes and neck and shoulder pain. According to World Health

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Organization (WHO), usage of mobile phone has become an addiction, they have introduced the word dependence syndrome to replace addiction (Saju, 2019).

Cell phone vision syndrome is one of the leading disorders which is prevalent in users of mobile phone devices, the important thing to notice about this syndrome is that users themselves did not know that they are suffering from cell phone vision syndrome until symptoms of this disorder begin to disturb their quality of life (Dongre *et al.*, 2017; Hu *et al.*, 2017). There is a need to find out the prevalence of this disorder along with its initial symptoms, due to which a person can realize the fact that he or she is suffering from cell phone vision syndrome. The aims of current study are to investigate the prevalence of cell phone vision syndrome, its symptoms and associated risk factors among private and public sector medical and dental students of Karachi.

MATERIALS AND METHODS

A cross-sectional prospective study was conducted in private and public sector medical and dental colleges of Karachi from January 2019 to September 2019. Calculated sample size was 400 students that were studying in the medical and dental colleges. They were randomly selected after verbal information of the research and their consent. The data has been collected through a set of questionnaire, which was pre-designed. The setting for the collection of the data has been classrooms, common rooms, cafeteria and open sports areas of the medical and dental colleges which has been surveyed by the different team members of the group. Those students were included who were using smartphones for pleasure, communication or study purpose for more than at least 1-year duration while those students who either did not give their consent for the study or with diagnosed eye problems or females with gross anemia were excluded from the study. The project had been conducted after the approval by the Departmental Research Committee of Community Health Sciences and finally by Ethical Review Board of Hamdard University.

The data was entered into the Statistical Package for the Social Sciences (SPSS) version 22 and was hence forth analyzed and results were inferred. For numerical variables mean with standard deviation were calculated and for categorical variables frequency and percentages were calculated. The risk factors associated with cellphone vision syndrome were identified by using ANOVA with Post-hoc Tuckey's test. To find out the association of ocular symptoms with those of the risk factors of Cellphone vision syndrome, binomial logistic regression model was calculated.

RESULTS

The mean age of the students surveyed was found to be 21.2 years with standard deviation of 1.82 years. The minimum age of the student was 18 years whereas the maximum age was 30 years. The gender distribution was 39.75% (159) male and 60.25% (241) female. The participants were found to be equally distributed for medical education i.e. 200 (50%) each for MBBS and BDS Program. Likewise, the current study intentionally selected 200 participants i.e. 50% each from public and private sector medical institutes of Karachi for equal distribution of socio-economic situations and burden of academic studies among the students (Table I).

Looking over the screen type used, about 72.50% (290) of the individuals had been using the android mobile, 21.25% (85) apple mobile, 4.25% (17) keypad mobile and only 2% (8) had been using notepad. The results clearly outline that the most used screen by the students in medical and dental college was android mobile. Majority of our research candidates were addicted to cell phone use. It was noted that more than 6 hs' screen time daily was 29.8% while very unfortunate observation of less than 1 h screen time was found in 6.3% of study participants. The data reported that while using a mobile phone 28% (112) of the students were habitual of continuous gaze and focus on the screen while 72% (288) either takes break or gets interrupted while focusing on screen. Since our study was conducted amongst the medical and dental students, they had varying level of knowledge for use of screen in light and health hazards of screen use in darker environments still only 11% participants mentioned that they never use cell phones in dark environment.

During the study, it was found that while using cell phone for prolong time period, 74% of the participants having knowledge for their eye safety so tend to adjust the brightness of the cell phone screen. Despite of the knowledge 26% of the participants had never adjusted the brightness of the cell phone to the environmental light. Cell phone companies has developed consideration for the safety of their customers and have developed blue light filters/ night shield for the safety of consumer's eyesight while using cell phone at night time. About 62.7% participants were using the night shields for protecting their eyesight. It was mentioned by 54.5% respondents that their use of cell phone was during the night more than the day time. Characteristics of study participants are presented in Table I. Results also reported that about 78.25% students were having symptoms of cell phone vision syndrome as presented in Figure 1.

Respondents during the survey stated that they were having different physical problems apart from disturbance

in eyesight. About 39.75% (159) respondents complained of varying degree of headache and or migraine which was directly related to the time span spent on screens. About 36% (144) of participants were having complaint of pain in neck, shoulder or back which was again directly related to their postures, positions and length of duration of cell phone use while 25.25% (101) were having variable degree of fatigue. Only 17.25% (69) of the respondents agreed of having different degrees of blurring of the vision while 24.25% (97) of the participants were having variable range of eyestrain during extensive use of cell phone at any time of the day or night. Constant focus and not blinking the eyelashes can cause dry eyes but only 9.5% (38) agreed of having eye dryness with cell phones while 10.75% (43) participants were having eye redness and irritation. When asked about the difficulty in refocusing eyes after prolong use of cell phone, only 9% (36) agreed with the problem and 5% (20) complained of having double vision during or after extended use of mobile phones as presented in Figure 2.

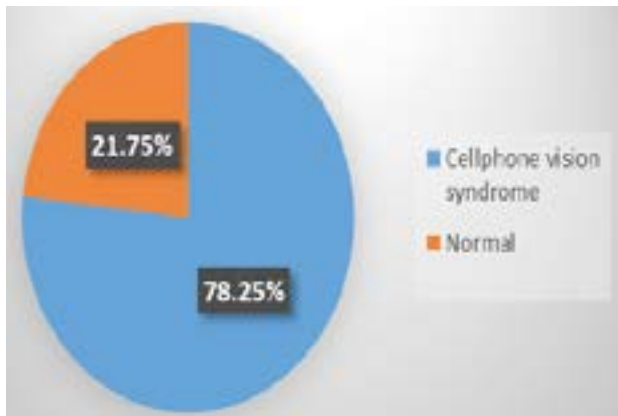


Fig. 1. Prevalence of cellphone vision syndrome.

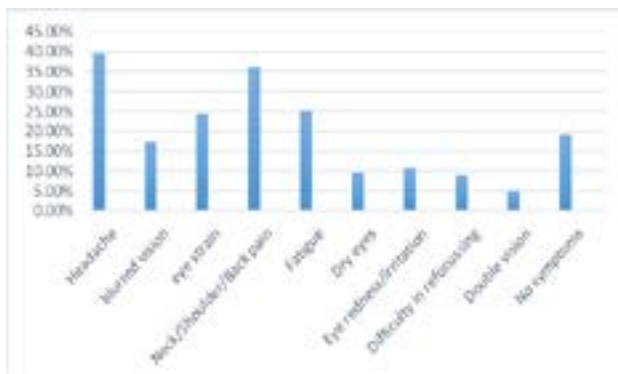


Fig. 2. Percentage of ocular symptoms among participants with cellphone vision syndrome.

Table I. Characteristics of study participants.

Variables	n=400 (%)
Gender	
Male	159 (39.75)
Female	241 (60.25)
Degree program	
MBBS	200 (50)
BDS	200 (50)
Educational sector	
Government	200 (50)
Private	200 (50)
Screen type used	
Android mobile	290 (72.5)
Apple mobile	85 (21.25)
Keypad mobile	17 (4.25)
Notepad	8 (2)
Hs spend in front of digital screen	
≤1 h	25 (6.25)
1-2 h	43 (10.75)
2-3 h	46 (11.5)
3-4 h	70 (17.5)
4-6 h	97 (24.35)
≥6 h	119 (29.75)
Focus on screen	
Continuous	112 (28)
Interrupted	288 (72)
Hs spend in dark room	
≤1 h	92 (25)
1-2 h	86 (21.5)
2-3 h	70 (17.5)
3-4 h	48 (12.0)
4-6 h	32 (8.0)
≥6 h	28 (7.0)
I don't use in dark	44 (11.0)
Adjust brightness	
Yes	296 (74)
No	104 (26)
Blue light filter in screen	
Yes	149 (37.25)
No	251 (62.75)
Major time distribution spent with screen	
Day	182 (45.5)
Night	218 (54.5)

Some of the risk factors have been identified in Table II which could be the reason for developing ocular symptoms which lead to cellphone vision syndrome, including number of hs spend on digital screen, duration of focus on screen, using screen in dark room, adjustment of screen brightness and use of blue light filter in screen. Results found that number of hours spending on digital screen, using screen in dark room and blue light filter

in screen were having a positive association with the development of ocular symptoms (p -value ≤ 0.05). Likewise, adjustment of screen brightness and number of hs spending on digital screen had a strong significant association with the cellphone vision syndrome as p -values were ≤ 0.05 as mentioned in Table III.

Table II. Association of appearing ocular symptoms with the risk factors of cellphone vision syndrome.

	Chi-square	df	p-value
Hours spend	62.603	45	0.042
Focus on screen	15.013	9	0.091
Using screen in dark room	84.196	54	0.005
Adjust brightness	9.083	9	0.430
Blue light filter on screen	20.142	9	0.017

Table III. Risk factors associated with cellphone vision syndrome.

	Mean square	df	p-value
Hours spend	0.759	5	0.000
Focus on screen	0.140	1	0.366
Using screen in dark room	0.152	6	0.501
Adjust screen brightness	0.912	1	0.021
Blue light filter in screen	0.124	1	0.394

DISCUSSION

Society has increased the use of cell phones and other smart devices with smaller screen; the cost of this enthusiasm is paid by the eyes of the individuals. Many individuals are found complaining about eye discomfort and problems related to vision when they use display screens. The amount and intensity of their discomfort has been identified by all to be directly proportionate to time duration on daily basis, which they spend on display screens (Munshi *et al.*, 2017). Perera *et al.* (2018) reported that consistent watching on smaller screen for hs, individual may start feeling headache, this shows that cell phone vision syndrome is not only limited to eyes and vision but it also has harmful effects on nervous system of a person due which individual feels headache. Gustafsson *et al.* (2017) reported that, victims of cell phone syndrome also encounter neck and shoulder pain due to excessive use of neck in downwards position. Lee and Low (2016) found that headache keeps students under stress every time; in fact, pattern and quality of sleep also get affected due to these symptoms. Shoulder and neck pain make a person feel discomfort while sleep.

There are multiple symptoms which are related to cell phone vision syndrome, these include eye strain, headaches, blurred vision, dry eyes and neck and shoulder pain (Klamm and Tarnow, 2015; Thilanka *et al.*, 2016). The most common symptoms found in the current study include headache and or migraine pain in neck, shoulder or back, fatigue, different degrees of blurring of the vision, variable range of eyestrain, dry eyes, eye redness, irritation, difficulty in refocusing eyes and double vision. Bogdănici *et al.* (2017) identified that along with many other complaints of physical and psychological nature, blurred vision is the most common symptom, when a person keeps on watching display screen for longer period of time his vision gets blurred, this blurring to vision is not temporary but get permanent if not corrected in short period of time. Baudouin *et al.* (2016) found dry eyes as eyes get fatigued along with redness, unusual discharge and irritation.

Coles & Brennan *et al.* (2019) suggested that the main causes which are noticed behind these symptoms are poor lightning of the rooms in which the digital gadgets are utilized, improper eye distance from display screens, the intensity of glare on the screen, uncorrected vision problem, wrong posture of angle of seating in front of display device or combination of all these factors. Current study also focused few of the factors including number of hs spend on digital screen, duration of focus on screen, using screen in dark room, adjustment of screen brightness and use of blue light filter in screen and found positive association with number of hs spending on digital screen, using screen in dark room and blue light filter. Aman *et al.* (2015) have also reported that the development of cellphone vision syndrome is directly proportional to the time of usage of smart phone.

In order to improve health conditions and remain protective from eye syndromes there are few recommendations for the students; first periodic checking of eyes, secondly smart device users should adjust display on user friendly mode, there are many smart devices which provide different option for display, and regular user of these devices should opt for user friendly option only which will not harm their eyes and vision. Thirdly, smart phone users or computer users should keep on changing their posture of sitting to give proper rest to the body which may prevent fatigue and muscle pain. Fourthly, maintenance of suitable lightning level also provide benefit and prevent stress level on eyes, users must adjust lightning level of their display devices. In addition to above, preventive measures regular users are should also take five minutes' break after every h of working. In fact, there is a rule which is known as 20-20 rule. In 20-20 rule the user of smart phone or any other display device is advised to watch a thing at distance of

20 feet for 20 seconds after every 20 minutes of working on display screen. Lastly, smart display devices users should take nutritional supplementation as well so that they remain healthy through physical exercise, preventive measures and nutrition (Rosenfield, 2016).

CONCLUSION

It has been concluding that majority of the students prefer using cell phones in the colleges and in their daily life activities which results in the deterioration of their health conditions along with impacting their quality of life. Prevalence of cellphone vision syndrome is about 78.25% while the most associated risk factors were number of hrs spending in front of digital screen and adjustment of screen brightness.

Statement of conflict of interest

The authors have declared no conflict of interest.

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