



Digital Vision Syndrome (DVS) Among Medical Students During Covid-19 Pandemic Curfew

Niveditha K P¹, Dheepak Sundar M^{*2}

¹Saveetha Medical College, Chennai-602105, Tamil Nadu, India

²Department of Ophthalmology, Saveetha Medical College, Chennai-602105, Tamil Nadu, India



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ABSTRACT

In the present era, mobiles and other digital display devices have become an essential part of our daily life. But due to the COVID-19 pandemic curfew, the use of digital gadgets has increased many folds, with direct proportion to increased health risks, especially eyes. In this study, we aim to assess the prevalence, risk factors and symptomatology of Digital vision syndrome (DVS) among medical students during the COVID-19 lockdown. This is a descriptive cross-sectional questionnaire-based study. The undergraduate medical students were asked to fill an electronic self-administered survey. The survey included questions regarding their digital device usage before and after the curfew and various factors related to DVS. Among 250 medical students during this lockdown period, it was observed the screen time or hours spent on using a digital screen by the respondents increased significantly in the 2-3 hours and 3-4 hours category and a significant difference ($p=0.000$) was observed in 1% level of significance in pre and post lockdown. No significant change was observed in the type and illumination of gadgets used. Around 60% of the students were in intensive lockdown, and up to 51% of the students felt the upsurge in DVS symptoms. Nearly 82.3% of students experienced one or more symptoms of DVS. The most commonly reported symptom was headache which shot up after the lockdown to 51.6% from 32.7%. It was followed by eye strain and dry eyes, which increased from 19.5% to 40.3% and 10% to 21% respectively after curfew. During the COVID-19 pandemic lockdown, there appeared to be an exacerbated increase in DVS symptoms among medical students, one of the leading reasons being increased screen time. A significant association was found between the rise in symptoms and intensive lockdown.

*Corresponding Author

Name: Dheepak Sundar M

Phone:

Email: dheepocean@gmail.com

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INTRODUCTION

Digital vision syndrome (DVS) is a medical condition, in which the patient suffers from a group of vision-related symptoms, chronic headaches, and other problems like neck and back pain due to prolonged exposure to digital screen (Altalhi *et al.*, 2020). The use of computers and digital screens for more than three hours a day makes the person at high risk of developing DVS. The common ocular symptoms experienced in DVS are headache, dry eye sensation, blurred vision, tearing, burning, itching and photophobia (Basnet *et al.*, 2018). The ease

in using electronic devices as study materials over the hard copy has increased the prevalence of DVS among students (Iqbal *et al.*, 2018).

The nationwide mandatory curfew and “stay at home” orders imposed in response to the COVID-19 pandemic has made everyone to work from home and spend extra leisure time with screens. Due to this, the students are also forced to attend online lectures and study via digital gadgets as the provision to attend college or have access to the library has been denied. This has created an enormous spike in exposure time to mobile and other screens (Bhat-tacharya *et al.*, 2020).

In this study, we have assessed the impact of COVID – 19 pandemic on prevalence, risk factors and the symptomatology DVS in a subset of medical students. The findings of this study would help in spreading awareness among the student community regarding the raising trend in DVS post lockdown.

MATERIALS AND METHODS

This cross-sectional questionnaire-based study was conducted among 250 undergraduate medical students studying in Saveetha medical college, Chennai, Tamil Nadu. Non- medico students were excluded. The study participants were asked to fill an electronic semi-structured Google forms based questionnaire (Tawil *et al.*, 2020).

The questionnaire was designed chiefly to obtain information regarding the amount and frequency of screen time exposure before and after lockdown and influence of lockdown on DVS symptomatology. A sample questionnaire has been attached (supplement). The data were interpreted and analysed using Statistical Package for Social Sciences (SPSS version 21.0). Descriptive statistical techniques were used to provide general details and responses. The relationship between variables was analysed using the chi-square test. The degrees of freedom (df) equals the number of values in a data set minus 1. The values obtained are expressed as percentage and number (within parenthesis).

RESULTS

Demographic data

The study included 250 undergraduate medical students comprising of 48.8% (122) male students and 51.2% (128) female students. The subjects selected for the study were aged above 18 years. Overall 29.2% (73) of the subjects were between 20 - 21 years of age, while 26.4% (66) and 25.2% (63) of the students belonged to the age group of 18-19 years

and 22-23 years respectively. Only 19.2 % (48) of the students were above 23 years.

It was observed that 84% (210) of the respondents had refractive errors, and 16% (40) were devoid of refractive errors. Concerning the type of refractive errors present, it was noted that 33.6% (84) of the study subjects had hypermetropia, 24% (60) subjects were known to have myopia and 26.4% (66) of the subjects suffered from blurred vision (unknown refractive error). The results also depicted that 52.8% (132) of the students were wearing spectacles to rectify the refractive error. Almost 59.6% (149) subjects remained in curfew for more than four months period, while 30.8% (77) and 9.6% (24) of the students were under curfew for 3-4 and less than three months respectively.

Digital screen exposure

There was an increasing trend in the percentage of respondents with the exposure time of 2-3 hours [20.8%(52) to 26.8%(67)] and 3-4 hours [20%(50) to 30.8%(77)], whereas a decrease in percentage was observed in the category of 1-2 hours [29.2%(73) to 8% (20)].

But uncharacteristically, the percentage of respondents spending less than 1 hour per day on digital screen increased after lockdown [8.8% (22) to 14.8% (37)]. There was minimal change in the 4-6 hours [13.2% (33) to 12% (30)]and more than 6 hours [8% (20) to 7.6% (19)] categories. A Strong association was found between the total hours spent on digital screen before and during the lockdown at 1 % level ($p = 0.000$). Total hours spent on using the digital screen by the selected subjects (Pre and Post lockdown) is shown in Table 1.

The frequency of digital screen usage by the selected subjects (Pre and Post lockdown) is shown in Table 2. There was an increase in the number of respondents in the frequency of digital screen exposure in the “very often” [51.2%(128) to 52.4%(131)] and “continuous” [18%(45) to 21.2%(53)] categories. In contrast, a decreasing trend was observed in the “interrupted” [18.8%(47) to 18%(45)]and “rarely” [12%(30) to 8.4%(21)]categories following lockdown (Table 2). No Statistical association was found between the frequency of digital screen usage and the pre, post lockdown period ($p=.508$).

It was noted that the use of digital gadgets was more spread through the daytime [33.6% (84) to 38% (95)] than night time [37.6% (94) to 34.4% (86)] following lockdown. The relationship between the time of the day spent on a digital screen, and the before and during the lockdown was not statistically significant at 5 % level ($p=.578$). Time of the day

spent on digital screen by the respondents (Pre and Post lockdown) is shown in Table 3.

Digital gadgets

There was a significant difference in the usage of mobile phones [51.2% (128) to 51.6% (129)]. The

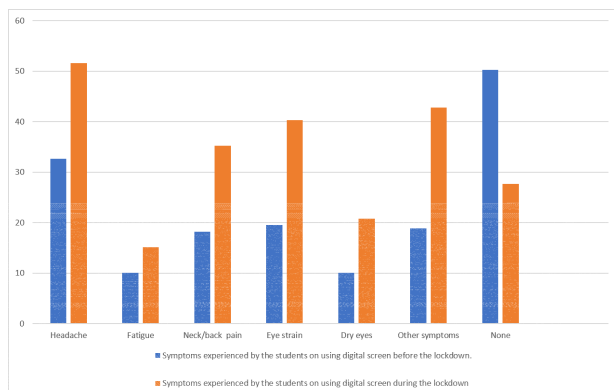


Figure 1: DVS symptoms experienced by the students before and after lockdown

use of laptop declined by 2% from 26.8% (67) to 24.8% (62). Tablets were used by 16% (40) post lockdown, while pre lockdown 12% (30) had used tablets. The use of desktop computers dropped from 10% (25) pre lockdown to 7.6% (19) post lockdown. But, the change in the use of digital gadgets was not statistically significant at 5% level ($p=0.485$). Type of digital screen used by the selected subjects (Pre and Post lockdown) is shown in Table 4.

Illumination refers to the brightness of the gadgets used. Light sensitivity can trigger dry eyes. Using the proper amount of illumination and the time of the day, we use digital devices to play a crucial role in protecting eyes. Irrespective of the digital devices used, 35.6% (89) and 32% (80) preferred between 26% and 50% of illumination during the day and night time, respectively. Meanwhile, 25.2% (63) and 31.6% (79) chose 11%-25% illumination during day and night time respectively, followed by 22.4% (56) and 20% (50) opting for 51%-75% illumination in their digital screens during day and the night. Only around 8% and 10% of the respondents used the extremes of illumination (76%-100%) during day and night, respectively.

DVS symptoms

The respondents were asked to select one or more of the symptoms experienced by them from a list of symptoms before and during lockdown which included: Headache, fatigue, dry eyes, blurred vision, eye strain, double vision, eye redness/irritation, difficulty in refocusing the eyes, lacrimal discharge in one or both eyes, neck/shoulder/back pain and none of the symptoms.

Of all, the headache was the most common symptom reported of DVS. The percentage of students having headache increased drastically after lockdown from 32.7% to 51.6%. There was a notable increase in eye strain from 19.5% to 40.3% and dry eyes from 10% to 21% during the lockdown as a consequence of the use of digital devices. Among the extraocular symptoms, neck, shoulder, or back pain was the most common symptom found in 18.2% of students which increased to 35.2% during the lockdown period. About 50.3% (80) did not experience any symptoms before lockdown, but the percentage dropped to 27.7% (44) during the lockdown. Almost 51% of the students felt that the mentioned symptoms intensified after lockdown (Figure 1).

Willingness to decrease screen time

Of the total participants, 87% of the participants observed a substantial impact of using the digital screen during this COVID-19 lockdown on eye health. Likewise, 92.8% (232) respondents were willing to decrease their screen hours to prevent their eye ailments.

DISCUSSION

The COVID-19 pandemic lockdown had sent humanity indoors, replacing human contact with an electronic connection (Munsamy and Chetty, 2020). Most colleges and workplaces have been forced to close, and the resulting use of alternative methods of teaching and studying has forced the screen time to increase drastically. This increased use of electronic devices and its influence has ascended a great concern on the health of the users. In this study, we aimed to assess the prevalence of DVS among undergraduate medical students during the COVID-19 lockdown.

Based on our study results, it was observed that there was a significant increase in the duration of digital screen exposure. An increasing trend was evident in the 2-3 and 3-4 hours category, although the rest of the categories did not show notable variation. But there was minimal changes observed in the 4-6 hours and more than 6 hours. Many studies imply that the duration of exposure to digital screen for more than 3 hours a day attributes to DVS (Munshi et al., 2017). Though the numbers are subjective based on an individual's response, our study highlights the fact that the screen exposure time has increased in the lockdown era.

There was no significant difference observed in the continuity of exposure or the type of digital gadgets used pre and post lockdown. It was also seen that mobile phones (pre lockdown: 51.2%, post lock-

Table 1: Total hours spent on using the digital screen by the respondents (Pre and Post lockdown)

Total hours spent per day	Pre lockdown		Post lockdown		P-value
	N	P	N	P	
Less than 1 hour	22	8.8	37	14.8	$\chi^2 = 41.805$ df = 5 p=.000*
1-2 hours	73	29.2	20	8	
2-3 hours	52	20.8	67	26.8	
3-4 hours	50	20	77	30.8	
4-6 hours	33	13.2	30	12	
More than 6hours	20	8	19	7.6	
Total	250	100	250	100	

N=Number; P= Percent; *1% level of significance

Table 2: The frequency of digital screen usage by the selected subjects (Pre and Post lockdown)

Frequency of usage	Pre lockdown		Post lockdown		P-value
	N	P	N	P	
Continuous	45	18	53	21.2	$\chi^2 = 2.319$ df = 3 p=.508
Very often	128	51.2	131	52.4	
Interrupted	47	18.8	45	18	
Rarely	30	12	21	8.4	
Total	250	100	250	100	

N=Number; P= Percent

Table 3: Time of the day spent on digital screen (Pre and Post lockdown)

Time of the day spent on the digital screen	Pre lockdown		Post lockdown		P-value
	N	P	N	P	
Day Time	84	33.6	95	38	$\chi^2 = 1.095$ df = 2 p=.578
Night Time	94	37.6	86	34.4	
Spillover Day & Night-Time	72	28.8	69	27.6	
Total	250	100	250	100	

N=Number; P= Percent

Table 4: Type of digital screen used by the selected subjects (Pre and Post lockdown)

Types of digital screen used	Pre lockdown		Post lockdown		P-value
	N	P	N	P	
Desktop computer screen	25	10	19	7.6	$\chi^2 = 2.444$ df = 3 p=.485
Laptop	67	26.8	62	24.8	
Tablet	30	12	40	16	
Mobile	128	51.2	129	51.6	
Total	250	100	250	100	

N=Number; P= Percent

down: 51.6%) was the common digital gadget used, due to the convenience in handling.

In our research, the most commonly reported symptom was headache 32.7% before curfew, which shot up after the lockdown to 51.6%. According to the [American Optometric Association \(2017\)](#), the headache was the most widely reported DVS symptom which is trailed by eye strain and dry eyes ([Hassan et al., 2017](#)). Improper sitting and screen postures cause other muscular and skeletal problems ([American Optometric Association, 2017](#); [Logaraj et al., 2014](#)), as seen in our study where, the prevalence of neck, shoulder, or back pain increased from 18.2% to 35.2%. Many students had dry eyes which may be attributed to the reduced blinking reflex and improper tear production due to increased screen exposure ([Abudawood et al., 2020](#)).

Around 60% of the students were in intensive lockdown, and (51%) of the students felt the increase in symptoms. Thus, the increase in symptoms shows relevance with the prolonged lockdown.

Since the students in this study were relatively young, they might have experienced symptoms only in severe cases.

Majority of the students (93.1%) felt that this lockdown served as a reason for increased digital screen usage and about (81.1%) students had an impression that this increased usage harmed their lifestyle and eye health during the curfew. Correspondingly 92.8% of the students were willing to decrease their screen hours to guard against DVS.

CONCLUSION

Limitations of this study include a cross-sectional study design conducted in a single institution, and DVS diagnosed based on self-reported symptoms without ophthalmic examination. As medical universities continuously reform their educational methods, there is a need to provoke awareness among students concerning their health effects allied to prolonged usage of computers and mobiles for studying. Preventive measures to reduce DVS associated symptoms should also be imparted. Intermittent exposure to digital screens with considerable refreshing breaks in-between online classes can be helpful. Online teaching classes can be scheduled 4-5 days a week instead of a daily basis. The students must be advised to monitor their screen time and maintain the same at lesser than 3-4 hours per day. Also, they must be well notified and hence be aware of the adverse effects of prolonged digital screen usage.

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Conflicts of Interest

The authors have declared that there is no conflicts of interests.

Author Contribution

We declare that all of the authors mentioned in the article have contributed equal efforts in this research and also for the submission of the article.

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