

# Impact of the use of digital devices on eyes during the lockdown period of COVID-19 pandemic

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**Purpose:** The purpose of this study is to observe pattern of digital device use and the various ocular, visual and systemic symptoms associated with them during the lockdown period of the novel coronavirus disease (COVID-19) pandemic. **Methods:** Two hundred and thirty-three volunteers were included in web-based open e-survey. The survey was designed on the 'Survey Monkey' website and distributed through social media platform. The information was collected regarding hours and numbers of digital devices along with numbers of digital activities carried out during the pandemic. A pretested symptom questionnaire was also included regarding ocular, visual and systemic symptoms before and during lockdown. The statistical analysis was carried out using Statistical Package of Social Science software. **Results:** During the pandemic, most of the respondents were engaged in more than two digital activities (73.81%) over more than two digital devices (48.50%) for more than six days (65.66%). Maximum respondents were mobile users (97.85%) spending major time on social media (89.70%). Symptoms including watering eyes ( $P = 0.000$ ), dry eyes ( $P = 0.000$ ), shoulder pain ( $P = 0.020$ ), back pain ( $P = 0.003$ ) and headache ( $P = 0.043$ ) showed positive correlation with hours of digital device use per day during lockdown, while itching eyes ( $P = 0.036$ ) and pain behind eyes ( $P = 0.025$ ) were the major symptoms in those engaged in a greater number of digital activities. Moreover, red eyes ( $P = 0.040$ ) were more prominent in respondents using multiple devices for a greater number of hours. **Conclusion:** A big jump in digital activities on multiple digital devices was seen during lockdown which are more prone to ocular symptoms. Acceleration of ocular and systemic symptoms was particular with rise in time spending on digital devices.

**Key words:** Statistical package of social science, video display terminal, COVID-19, Lockdown

Nationwide lockdown was implemented by government of India as preventive measures by restricting people's movement after outbreak of the novel coronavirus disease (COVID-19) declared by the World Health Organization (WHO).<sup>[1,2]</sup> Due to the pandemic, there was stay at home confinement<sup>[3]</sup> with many unprecedented changes such as insomnia,<sup>[2,4]</sup> depression,<sup>[5]</sup> stress,<sup>[3,6]</sup> anxiety,<sup>[3,4]</sup> increase in indoor activities and excessive screen time.<sup>[4,7]</sup>

Video display unit (VDU) including digital and electronic devices' use has increased exponentially as a part of our daily life routine.<sup>[7-12]</sup> Viewing or using anything with a screen, including computer, television (TV), video games and digital versatile disc, is defined as screen time.<sup>[11]</sup> In the pre-pandemic era, a United Kingdom study estimated 4 h and 45 min of digital media use,<sup>[10]</sup> whereas 5 or more hours were spent on digital devices by two-third of the United States of American adults aged 30–49 years. Moreover, 68% computer use and 54% online

activities were reported by the age of 3 years in a multinational European study.<sup>[13]</sup> Simultaneous use of two or more devices was found to be done by 87% of 20–29 years of individuals for social media and multitasking.<sup>[10]</sup>

As per American Optometric Association, an array of eye and vision-related problems develop with as little as 2 h/day of continuous digital device use and referred as digital eye strain.<sup>[14]</sup> A constellation of various ocular symptoms was evident with use of the VDU which is grouped under 'computer vision syndrome',<sup>[15-18]</sup> including eyestrain, watering eyes, headache, tired eyes, burning sensation, red eyes, irritation, dry eye, foreign body sensation, blurred vision at near and double vision.<sup>[7,10,16-36]</sup> Moreover, musculoskeletal symptoms such as shoulder pain, neck pain, back pain and wrist pain are also prevalent in VDU users.<sup>[23,37,38]</sup>

Although an increase prevalence of digital eye strain was noted in the pandemic era among children, it was fully subjective given by their parents.<sup>[39]</sup> Although adults above 18 showed a deterioration of their ocular health by involving themselves in

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multiple digital activities,<sup>[14]</sup> different types of digital devices were not taken into consideration. Also, there lack an evidence of musculoskeletal symptoms getting affected by digital device use along with the ocular symptoms which is of utmost importance. In the view of above facts, this study aimed at finding the pattern of digital device use and the various ocular, visual and systemic symptoms associated with them during lockdown.

## Methods

The study targeted the individuals between 15 and 30 years of age. Individuals having positive ocular history (retinal problems, glaucoma, ocular surgery, contact lens users) were excluded along with those who were wearing old (>1 year) spectacle correction ( $R_x$ ). Required sample size of 240 was calculated with formula  $4pq/d^2$  ( $P = 87\%$ ,  $d$  was 5% of prevalence).

Only fully completed responses were included. Repeated and duplicate responses were identified and excluded. Similarly, the incomplete data were not taken into consideration for further analysis. A total of 300 respondents completed the survey of which 233 respondents were included according to inclusion and exclusion criteria (13 = with positive ocular history, 10 = older spectacle  $R_x$ , 15 = duplicate responses, 29 = incomplete responses).

The e-survey was designed on Survey Monkey App (<https://www.surveymonkey.com/>) comprising four sections: demographic data, ocular health information, digital device usage during the lockdown followed by last two pages of a pretested six-point questionnaire of ocular, visual and systemic symptoms before and during lockdown [Fig. 1].<sup>[30]</sup> The study was approved by institutional ethics committee which adhered to the tents of the Declaration of Helsinki and distributed on social platforms (Facebook, WhatsApp, Instagram) among the targeted individuals. All the respondents were encouraged to forward the e-survey. Respondents were given short idea about the study in the disclaimer along with the assurance of their confidentiality.

The data of all the respondents were exported from Survey Monkey website in Excel form. The respondents were divided into groups depending on hours of digital device used (0 <2 h, 2-<4 h, 4-<6 h, >6 h), number of digital devices used (one device, two devices, more than two devices) and number of digital activities done (one activity, two activities, more than two activities) for the further analysis.

### Statistical analysis

Mean  $\pm$  standard deviation were used for distribution of all the continuous variables. One-way analysis of variance (ANOVA) was performed to find the difference between the symptom scores along with the hours of digital device use before and during lockdown including the comparison of the total and individual symptoms score with number of digital devices used and number of digital activities carried out during lockdown with the significant value of  $P < 0.005$ . A dependent sample  $t$ -test was conducted to compare individual and total symptoms score before and during lockdown. Correlation among different variables was found using the Pearson correlation test. All the data were analysed using the statistical tools in Statistical Package of Social Science (SPSS version 14).

**Table 1: Descriptive analysis**

Parameters	Particulars
Age [M $\pm$ SD]	22.52 $\pm$ 4 years
Gender [n (%)]	
Male	107 (45.92%)
Female	126 (54.07%)
Occupation [n (%)]	
Students	137 (58.79%)
Health professionals	46 (19.74%)
IT professionals	26 (11.15%)
Self-employed	24 (10.30%)
Hours of digital devices use [n (%)]	
Before lockdown	
0-<2 h	11 (4.72%)
2-<4 h	109 (46.78%)
4-<6 h	84 (36.05%)
>6 h	29 (12.44%)
During lockdown	
0-<2 h	0 (0%)
2-<4 h	15 (6.43%)
4-<6 h	65 (27.89%)
>6 h	153 (65.66%)
Number of digital device use during lockdown [n (%)]	
1 device	34 (14.59%)
2 devices	86 (36.90%)
>2 devices	113 (48.49%)
Number of digital activities during lockdown [n (%)]	
1 activity	16 (6.86%)
2 activities	42 (18.02%)
>2 activities	175 (75.10%)

## Results

The descriptive analysis of the respondents is depicted in Table 1 along with mean age and gender [Table 1].

All ocular symptom scores including watering eyes, dry eyes, itching eyes, pain behind eyes, aching eyes, tired eyes and red eyes showed a significant difference during lockdown with  $P < 0.0001$  and sore eyes with  $P = 0.001$ . Also, visual symptom scores like blurred vision ( $P < 0.0001$ ) and double vision ( $P = 0.014$ ) along with systemic symptom comprising shoulder pain ( $P < 0.0001$ ), neck pain ( $P < 0.0001$ ) and back pain ( $P < 0.0001$ ) scores differed during lockdown as compared to pre-lockdown scores [Fig. 1].

Those using digital devices for more than 6 h showed a marked increase in the symptom scores, including watering eyes ( $P < 0.0005$ ), dry eyes ( $P < 0.0005$ ), red eyes ( $P = 0.006$ ), shoulder pain ( $P = 0.038$ ), back pain ( $P = 0.003$ ), headache ( $P = 0.030$ ) and total symptoms score ( $P = 0.009$ ) during the lockdown [Table 2].

Positive correlation was established between symptom scores comprising watering eyes ( $r = 0.23$ ,  $P = 0.000$ ), dry eyes ( $r = 0.33$ ,  $P = 0.000$ ), shoulder pain ( $r = 0.15$ ,  $P = 0.020$ ), back

pain ( $r = 0.196, P = 0.003$ ) and headache ( $r = 0.132, P = 0.043$ ) and hours of digital device use during lockdown, whereas with increase in number of digital activities there was rise in symptoms like itching eyes ( $r = 0.13, P = 0.036$ ), pain behind eyes ( $r = 0.14, P = 0.025$ ) and aching eyes ( $r = 0.18, P = 0.005$ ). Also, red eyes symptom score was found to increase with both increased use of number of digital devices ( $r = 0.13, P = 0.040$ ) and hours of digital device use per day during lockdown ( $r = 0.20, P = 0.001$ ). Similarly, total symptom score during lockdown was more with hours of digital device use ( $r = 0.15, P = 0.020$ ) along with increase in number of digital activities ( $r = 0.18, P = 0.009$ ). On the contrary, neck pain ( $r = -0.14, P = 0.030$ ) symptom score

had a negative correlation with number of digital devices use during lockdown.

We observed that during pandemic, 89.70% respondents spend their time on social media following net surfing, E-reading, gaming, TV serials and office work. This study also reported that 97.85% respondents spent time on mobile, 70.82% respondents used TV, 61.80% laptop/computer, 6.81% tablet and 3% PlayStation. Moreover, Figs. 2 and 3 show the percentage of digital device usage according to number of digital device and activities, respectively.

### Discussion

An increase in digital device use with influence on health in adults or college students is evident in past few years<sup>[35,40,41]</sup> in pre-pandemic situation. Studies by John *et al.*<sup>[35]</sup> and Gauri *et al.*<sup>[30]</sup> observed that individuals spent 6 hours/day on an average on computers. Sixty per cent Americans were habituated using digital devices for 5 or more hours/day with 70% of Americans multitasking with more than two devices.<sup>[12]</sup> Likewise, after the advent of the novel coronavirus, a shift of social and professional activities to a web-based platform has shown sudden increase in digital device usage along with overall number of screen time logged per day.<sup>[14]</sup> A remarkable increase in amount of digital device use from  $3.9 \pm 1.9$  h to 5 or more hours was evident during lockdown among children as well as adults, respectively.<sup>[14,39]</sup> A similar pattern of digital device use was observed in our study with respondents spending more than 6 h on digital devices during lockdown as compared to pre-lockdown situation.

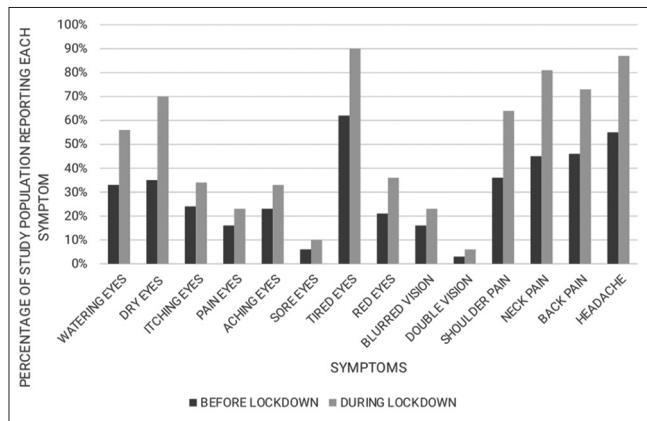


Figure 1: Percentage of symptoms experienced before and during lockdown

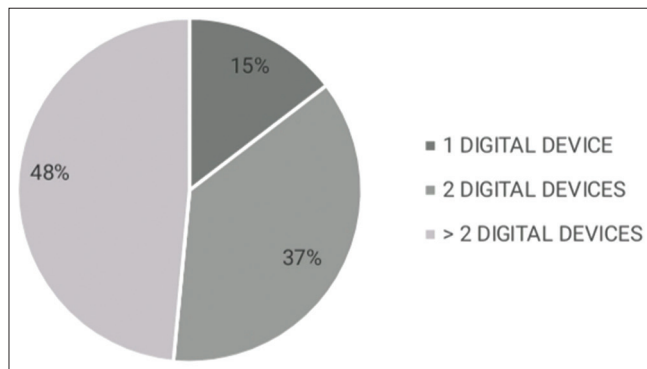


Figure 2: Percentage of number of digital devices used during lockdown

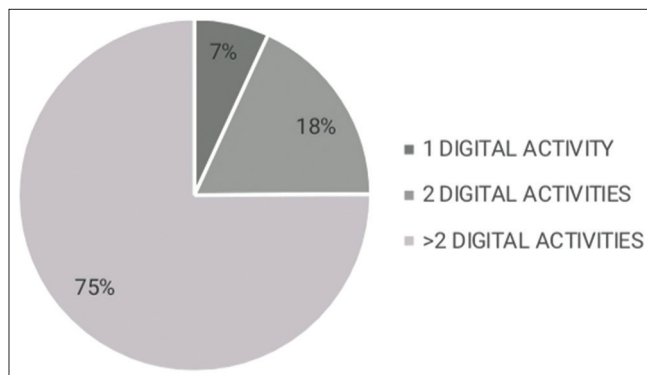


Figure 3: Percentage of digital activities used during lockdown

Mobile continued to be the most used digital device among all age groups during pre-lockdown<sup>[31,36,42]</sup> as well as in lockdown scenario<sup>[39]</sup> which was also noticed in this study. Even though a pandemic study included types and number of digital devices among children,<sup>[39]</sup> there lack an evidence of such information among the adult population which added on value to this study. Recent study established use of multiple devices for online classes by 20.3% of children.<sup>[39]</sup> Comparatively, our study found higher amount of percentage of individuals (48% using two digital devices followed by 37% >two devices) with 75% of total individuals engaging themselves in multiple digital activities.

Analysis on symptomology depicted that watering eyes, dry eyes and red eyes were the common ocular complaints in respondents spending more than 6 h on the digital devices along with systemic symptoms comprising shoulder pain, back pain and headache. Nearly similar pattern of symptoms was demonstrated in study conducted in North Indian population where individual spending more than 4 hours on digital devices were found to have severe dry eyes.<sup>[26]</sup> Adding on more, people experienced back pain and neck pain with spending 5 or more hours using digital devices<sup>[12]</sup> and pain and blurred vision using 20 min of iPad and computer.<sup>[18]</sup> Another study found that various ocular symptoms were being accelerated with 5 h of digital work; eyestrain and headache being most common complaints.<sup>[21]</sup> such comparisons were missing in recent studies conducted during pandemic.

Headache<sup>[14,39]</sup> and itching<sup>[39]</sup> were declared as commonly experienced symptoms with higher amount of digital device use during lockdown. Moreover, different pre-lockdown studies showed different set of symptoms regarding digital

**Table 2: Comparison between symptom score and hours of digital device use per day during lockdown**

	Hours of digital device use	<i>n</i>	Mean±SD	<i>F</i>	<i>P</i>
Total symptom score during lockdown	2->4 h/day	15	9.73±4.14	4.774	0.009
	4-<6 h/day	65	10.06±6.86		
	>6 h/day	153	12.92±7.05		
	Total	233	11.91±6.97		
Ocular symptoms					
Watering eyes score during lockdown	2->4 h/day	15	0.66±1.04	8.732	0.000
	4-<6 h/day	65	0.52±0.83		
	>6 h/day	153	1.07±0.93		
	Total	233	0.89±0.94		
Dry eyes score during lockdown	2->4 h/day	15	0.46±0.51	14.451	0.000
	4-<6 h/day	65	0.80±0.79		
	>6 h/day	153	1.38±0.96		
	Total	233	1.16±0.95		
Itching eyes score during lockdown	2->4 h/day	15	0.33±0.61	0.634	0.531
	4-<6 h/day	65	0.64±0.95		
	>6 h/day	153	0.56±1.01		
	Total	233	0.57±0.97		
Pain behind eyes score during lockdown	2->4 h/day	15	0.66±0.97	1.290	0.277
	4-<6 h/day	65	0.44±0.79		
	>6 h/day	153	0.34±0.78		
	Total	233	0.39±0.79		
Aching eyes score during lockdown	2->4 h/day	15	0.53±0.74	0.010	0.991
	4-6 h/day	65	0.52±0.88		
	>6 h/day	153	0.50±0.82		
	Total	233	0.51±0.83		
Sore eyes score during lockdown	2->4 h/day	15	0.13±0.51	0.195	0.823
	4-<6 h/day	65	0.15±0.56		
	>6 h/day	153	0.20±0.65		
	Total	233	0.18±0.61		
Tired eyes score during lockdown	2->4 h/day	15	1.66±0.72	0.008	0.992
	4-6 h/day	65	1.66±0.94		
	>6 h/day	153	1.64±0.92		
	Total	233	1.65±0.91		
Red eyes score during lockdown	2->4 h/day	15	0.06±0.25	5.237	0.006
	4-<6 h/day	65	0.40±0.86		
	>6 h/day	153	0.71±0.97		
	Total	233	0.58±0.92		
Visual symptoms					
Blurred vision score during lockdown	2->4 h/day	15	0.33±0.61	0.063	0.939
	4-<6 h/day	65	0.40±0.82		
	>6 h/day	153	0.36±0.78		
	Total	233	0.37±0.78		
Double vision score during lockdown	2->4 h/day	15	0.00±0.00	0.477	0.621
	4-<6 h/day	65	0.10±0.40		
	>6 h/day	153	0.08±0.39		
	Total	233	0.08±0.38		
Systemic symptoms					
Shoulder pain score during lockdown	2->4 h/day	15	0.86±0.91	3.316	0.038
	4-<6 h/day	65	0.83±1.11		
	>6 h/day	153	1.20±1.03		
	Total	233	1.08±1.05		

Contd...



Table 2: Contd...

	Hours of digital device use	n	Mean±SD	F	P
Neck pain score during lockdown	2->4 h/day	15	1.26±0.79	1.771	0.172
	4-<6 h/day	65	1.20±1.13		
	>6 h/day	153	1.46±0.91		
	Total	233	1.37±0.97		
Back pain score during lockdown	2->4 h/day	15	1.13±1.35	5.940	0.003
	4-<6 h/day	65	1.01±1.24		
	>6 h/day	153	1.58±1.10		
	Total	233	1.39±1.18		
Headache score during lockdown	2->4 h/day	15	1.60±1.12	3.554	0.030
	4-<6 h/day	65	1.35±1.08		
	>6 h/day	153	1.76±1.01		
	Total	233	1.63±1.05		

device use. Eyestrain, irritation, eye fatigue, blurred vision, burning sensation and dry eyes were typical ocular symptoms in computer users. On the other hand, non-ocular symptoms such as neck pain, back pain, headache and shoulder pain were prominent in VDU users.<sup>[15]</sup> However, the commonest symptoms in VDU users were related to eyes. Various symptoms including eyestrain, blurred vision, diplopia and dry eye were experienced by 64–90% of computer users after prolonged computer use,<sup>[17]</sup> while a greater prevalence of dry eye symptoms was seen during computer operation. A New York study reported that symptoms after sustained computer use were significantly worse during the task, especially blurred vision.<sup>[43]</sup> Similarly, in present study, watering eyes and dry eyes were more prominent in those spending longer hours on digital devices. In addition to ocular symptoms, systemic symptoms like shoulder pain, back pain and headache showed significant increase with hours of digital device use. Specifically, symptoms like watering eyes, dry eyes, shoulder pain, back pain and headache showed marked increase with increased use of digital devices in this study. Where other studies found positive association of neck pain with using multiple digital devices,<sup>[7]</sup> our study reported neck pain to be decreased with number of digital device use. However, the reason for this is unknown.

Respondents experiencing red eyes are more likely to get affected by performing more than two activities according to this study. Symptoms including itching eyes, pain behind eyes and aching eyes were significantly increased with a greater number of digital devices. On the contrary, systemic symptoms were more likely to occur as compared to visual symptoms in the past study in those who use two or more devices simultaneously.<sup>[12]</sup> Nevertheless, these symptoms were not taken into consideration in a study conducted by Abdullah *et al.*<sup>[31]</sup> No such comparisons were found in lockdown studies.<sup>[14,39]</sup>

Age and gender showed no statistical significance with any of the symptoms. However, ocular and visual symptoms were inclined towards females.<sup>[7,14,39,31,44-51]</sup> All the symptoms were significantly worse during lockdown which indicates that the digital device users need to educate on preventive measures from eye and healthcare professionals.

### Limitations

Due to the COVID-19 pandemic guidelines, this study could not incorporate the objective assessments such as

comprehensive eye examination, uncorrected refractive error<sup>[52]</sup> accommodation and convergence status of the eyes, dry eye assessments and ergonomics, which were taken care in the pre-pandemic situation which can be incorporated by future studies with all preventive measures. Also, sleeping patterns were not taken into consideration consisting of major factor leading to symptomology.

### Conclusion

Respondents spent longer amount of time as compared to pre-pandemic situation. More than half of the respondents were involved in various digital activities on multiple devices during lockdown. Social media was the most used platform with majority of people using mobile for more than 6 h/day. Ocular symptoms such as watering eyes and dry eyes with systemic symptoms including shoulder pain, back pain and headache showed rise during lockdown with increase in digital device use. On the other hand, multiple digital device users were more prone to red eyes. Also, symptoms comprising itching eyes and pain behind eyes were hiked with increasing digital activity.

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### Conflicts of interest

There are no conflicts of interest.

### References

1. Khanna RC, Cicinelli MV, Gilbert SS, Honavar SG, Murthy GS. COVID-19 pandemic: Lessons learned and future directions. *Indian J Ophthalmol* 2020;68:703-10.
2. Parmet WE, Sinha MS. Covid-19-The law and limits of quarantine. *N Engl J Med* 2020;382:e28.
3. Thakur V, Jain A. COVID 2019-suicides: A global psychological pandemic. *Brain Behav Immun* 2020;88:952-3.
4. DiGiovanni C, Conley J, Chiu D, Zaborski J. Factors influencing compliance with quarantine in Toronto during the 2003 SARS outbreak. *Biosecur Bioterror* 2004;2:265-72.
5. Lee S, Chan LY, Chau AM, Kwok KP, Kleinman A. The experience of SARS-related stigma at Amoy gardens. *Soc Sci Med* 2005;61:2038-46.
6. Wong CW, Tsai A, Jonas JB, Ohno-Matsui K, Chen J, Ang M, *et al.* Digital screen time during the COVID-19 pandemic: Risk for a further myopia boom? *Am J Ophthalmol* 2021;223:333-7.

7. Iwakiri K, Mori I, Sotoyama M, Horiguchi K, Ochiai T, Jonai H, *et al.* [Survey on visual and musculoskeletal symptoms in VDT workers]. *Sangyo Eiseigaku Zasshi* 2004;46:201-12.
8. González-Pérez M, Susi R, Antona B, Barrio A, González E. The computer-vision symptom scale (CVSS17): Development and initial validation. *Invest Ophthalmol Vis Sci* 2014;55:4504-11.
9. Parihar JK, Jain VK, Chaturvedi P, Kaushik J, Jain G, Parihar AK. Computer and Visual display terminals (VDT) Vision syndrome (CVDTS). *Med J Armed Forces India* 2016;72:270-6.
10. Sheppard AL, Wolffsohn JS. Digital eye strain: Prevalence, measurement and amelioration. *BMJ Open Ophthalmol* 2018;3:e000146.
11. Sweetser P, Johnson D, Ozdowska A, Wyeth P. Active versus passive screen time for young children. *Australas J Early Child* 2012;37:94-8.
12. Council, Vision. Eyes overexposed: The digital device dilemma. (2016). APA format derived from google scholar.
13. Palaiologou I. Children under five and digital technologies: Implications for early years pedagogy. *Eur Early Child Educ Res J* 2016;24:5-24.
14. Computer vision syndrome (CVS). American Optometric Association. Available from: <http://www.aoa.org/x5374.xml>. [Last accessed 2020 Aug 24].
15. Blehm C, Vishnu S, Khattak A, Mitra S, Yee RW. Computer vision syndrome: A review. *Surv Ophthalmol* 2005;50:253-62.
16. Yan Z, Hu L, Chen H, Lu F. Computer vision syndrome: A widely spreading but largely unknown epidemic among computer users. *Comput Hum Behav* 2008;24:2026-42.
17. Rosenfield M. Computer vision syndrome: A review of ocular causes and potential treatments. *Ophthalmic Physiol Opt* 2011;31:502-15.
18. Phamonvaechavan P. A comparison between effect of viewing text on computer screen and iPad® on visual symptoms and functions. *Siriraj Med J* 2017;69:185-9.
19. Maducdoc MM, Haider A, Nalbandian A, Youm JH, Morgan PV, Crow RW. Visual consequences of electronic reader use: A pilot study. *Int Ophthalmol* 2017;37:433-9.
20. Thomson WD. Eye problems and visual display terminals--The facts and the fallacies. *Ophthalmic Physiol Opt* 1998;18:111-9.
21. Salibello C, Nilsen E. Is there a typical VDT patient? A demographic analysis. *J Am Optom Assoc* 1995;66:479-83.
22. Cole BL, Maddocks JD, Sharpe K. Effect of VDUs on the eyes: Report of a 6-year epidemiological study. *Optom Vis Sci* 1996;73:512-28.
23. Lie I, Watten RG. VDT work, oculomotor strain, and subjective complaints: An experimental and clinical study. *Ergonomics* 1994;37:1419-33.
24. Scheiman M. (1996). Accommodative and binocular vision disorders associated with video display terminals: Diagnosis and management issues. *J Am Optom Assoc* 1996;67:531-9.
25. Bhandari DJ, Choudhary S, Doshi VG. A community-based study of asthenopia in computer operators. *Indian J Ophthalmol* 2008;56:51-5.
26. Titiyal JS, Falera RC, Kaur M, Sharma V, Sharma N. Prevalence and risk factors of dry eye disease in North India: Ocular surface disease index-based cross-sectional hospital study. *Indian J Ophthalmol* 2018;66:207-11.
27. Kim DJ, Lim CY, Gu N, Park CY. Visual fatigue induced by viewing a tablet computer with a high-resolution display. *Korean J Ophthalmol* 2017;31:388-93.
28. Knave BG, Wibom RI, Voss M, Hedström LD, Bergqvist UO. Work with video display terminals among office employees: I. Subjective symptoms and discomfort. *Scand J Work Environ Health* 1985;11:457-66.
29. Ichhpujani P, Singh RB, Foulsham W, Thakur S, Lamba AS. Visual implications of digital device usage in school children: A cross-sectional study. *BMC Ophthalmol* 2019;19:76.
30. Shrestha GS, Mohamed FN, Shah DN. Visual problems among video display terminal (VDT) users in Nepal. *J Optom* 2011;4:56-62.
31. Alamri AA, Alhibshi N, Alnefaie M, Alzhrani W, Almaymuni A, Mosli M. Patterns of digital device usage and its related health effects on elementary and middle school students: An instrument development and regression analysis. *Electron Physician* 2018;10:7333-40.
32. Sheedy JE, Hayes J, Engle AJ. Is all asthenopia the same? *Optom Vis Sci* 2003;80:732-9.
33. Nakamura S, Kinoshita S, Yokoi N, Ogawa Y, Shibuya M, Nakashima H, *et al.* Lacrimal hypofunction as a new mechanism of dry eye in visual display terminal users. *PLoS One* 2010;5:e11119.
34. del Mar Seguí M, Cabrero-García J, Crespo A, Verdú J, Ronda E. A reliable and valid questionnaire was developed to measure computer vision syndrome at the workplace. *J Clin Epidemiol* 2015;68:662-73.
35. Hayes JR, Sheedy JE, Stelmack JA, Heaney CA. Computer use, symptoms, and quality of life. *Optom Vis Sci* 2007;84:E738-55.
36. Park JS, Choi MJ, Ma JE, Moon JH, Moon HJ. Influence of cellular phone videos and games on dry eye syndrome in university students. *J Korean Acad Community Health Nurs* 2014;25:12-23.
37. Grandjean E. editor. *Ergonomics and Health In Modern Offices*. London: Taylor and Francis; 1984.
38. Starr SJ, Shute SJ, Thompson CR. Relating posture to discomfort in VDT use. *J Occup Med* 1985;27:269-71.
39. Mohan A, Sen P, Shah C, Jain E, Jain S. Prevalence and risk factor assessment of digital eye strain among children using online e-learning during the COVID-19 pandemic: Digital eye strain among kids (DESK study-1). *Indian J Ophthalmol* 2021;69:140-4.
40. Leviäkangas P. Digitalisation of Finland's transport sector. *Technol Soc* 2016;47:1-15.
41. Parviainen P, Tihinen M, Kääriäinen J, Teppola S. Tackling the digitalization challenge: How to benefit from digitalization in practice. *Int J Inf Syst Proj Manag* 2017;5:63-77.
42. Moon JH, Kim KW, Moon NJ. Smartphone use is a risk factor for pediatric dry eye disease according to region and age: A case control study. *BMC Ophthalmol* 2016;16:188.
43. Chu C, Rosenfield M, Portello JK, Benzoni JA, Collier JD. A comparison of symptoms after viewing text on a computer screen and hardcopy. *Ophthalmic Physiol Opt* 2011;31:29-32.
44. Smith JA. The epidemiology of dry eye disease. *Acta Ophthalmol Scand* 2007;85. Available from: [https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1600-0420.2007.01063\\_2858.x](https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1600-0420.2007.01063_2858.x).
45. McCarty CA, Bansal AK, Livingston PM, Stanislavsky YL, Taylor HR. The epidemiology of dry eye in Melbourne, Australia. *Ophthalmology* 1998;105:1114-9.
46. Lin PY, Tsai SY, Cheng CY, Liu JH, Chou P, Hsu WM. Prevalence of dry eye among an elderly Chinese population in Taiwan: The Shihpai eye study. *Ophthalmology* 2003;110:1096-1101.
47. Gupta N, Prasad I, Jain R, D'Souza P. Estimating the prevalence of dry eye among Indian patients attending a tertiary ophthalmology clinic. *Ann Trop Med Parasitol* 2010;104:247-55.
48. Basak SK, Pal PP, Basak S, Bandyopadhyay A, Choudhury S, Sar S. Prevalence of dry eye diseases in hospital-based population in West Bengal, Eastern India. *J Indian Med Assoc* 2012;110:789-94.
49. Rege A, Kulkarni V, Puthran N, Khandgave T. A clinical study of subtype-based prevalence of dry eye. *J Clin Diagn Res* 2013;7:2207-10.
50. Sahai A, Malik P. Dry eye: Prevalence and attributable risk factors in a hospital-based population. *Indian J Ophthalmol* 2005;53:87-91.
51. Shah S, Jani H. Prevalence and associated factors of dry eye: Our experience in patients above 40 years of age at a Tertiary care center. *Oman J Ophthalmol* 2015;8:151-6.
52. Wiggins NP, Daum KM. Visual discomfort and astigmatic refractive errors in VDT use. *J Am Optom Assoc* 1991;62:680-4.

## e-questionnaire

Quarantine with digital devices: need an eye check-up after the lockdown?

In a phase of 'Stay Home Stay Safe' we all are exploring ways to 'stay positive'. To stave-off the boredom people started to surf net to try out new recipes, quick exercises, gaming, reading books and what not.

'Don't you feel this has increased the use of digital devices?' If yes, then 'will it affect our eyes?'

Well!! This survey is to find the answers to these questions.

I, Miss Simran Parkar, would appreciate it, if you could complete the survey; completion of which is expected to take 6 min. The questions are quite general and there are no known or anticipated risks of participation in this study. Your participation is voluntary and anonymous. All information you provide will be kept confidential.

Top of Form

\*1. Date

Date of filling the form

Date

\*2. Name

\*3. Age

\*4. Gender

\*5. Occupation

\*6. Address

Next

\*7. When did you change your spectacles/contact lens?

\*8. Do you have any eye condition or eye disease?

\*9. Have you undergone any eye surgery?

10. Specify your eye condition/disease or eye surgery.

Prev. next

Bottom of Form

\*11. Which digital devices do you use during lockdown?





\*15. Tick the symptoms you are experiencing during lockdown

	None	Very mild	Mild	Moderate	Intense	Very intense
Watering eyes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dry eyes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Itching eyes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pain behind eyes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aching eyes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sore eyes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tired eyes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Red eyes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Blurred vision	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Double vision	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shoulder pain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Neck pain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Back pain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Headache	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Prev. done