European Journal of Molecular & Clinical Medicine (EJMCM)
ISSN: 2515-8260 Volume 07, Issue 11, 2020

Original research article

Progress of medical undergraduates to an era of computer vision syndrome and insomnia as an aftermath of increased digitalization during covid-19 pandemic

Vijaya Lakshmi

MBBS. MD, Associate Professor, Department of Physiology, School of Medical Sciences & Research, Sharda University, Knowledge Park III, Greater Noida, UP, India.

Corresponding Author: Dr. Vijaya Lakshmi

Abstract

Background: WHO declared COVID 19 as a global pandemic in March 2020. Lockdown and travel restrictions were imposed in most countries including India, to reduce the spread of SARS-COV-2 Virus and reduce mortality. Aftermath of this was that technology has become the only tool for people to interact, communicate and even to continue their responsibilities. Educational institutions including Medical colleges were closed globally, pedagogical innovations including technology and simulation based teaching were brought to the forefront during the current pandemic worldwide. This lead to excessive exposure to digital screen for any reason, be it for education or entertainment.

Aim & Objective: To estimate the prevalence of computer vision syndrome and to identify whether medical undergraduates suffered from sleep disorder like insomnia during Covid -19 pandemic as well as to assess the relationship between insomnia and computer vision syndrome in these students.

Methods: Descriptive cross-sectional study was carried out on medical undergraduates with Questionnaires based on Google form. The survey instruments were Computer
Vision Syndrome Questionnaire (CVS-Q) to assess the frequency of (i) symptoms of computer vision syndrome/ digital eye strain, pattern of computer usage and (ii) Insomnia severity index questionnaire including the demographic details of the participants.

Results: The study shows that e-learning by medical undergraduates during the COVID 19 pandemic has given rise to various side effects leading to deterioration of their health parameters. Most common effects were both ocular as well as non-ocular symptoms of computer vision syndrome. Even clinical insomnia of moderate severity was reported by 70% of the participants.

Conclusion: Health issues related to excessive use of digital devices has become alarmingly high during COVID-19 pandemic. Preventive measures to reduce Computer vision syndrome associated symptoms and Insomnia should also be imparted to the students. There is also an urgent need to make an institutional policy involving all stakeholders to formulate effective strategies to prevent young generation from the detrimental health effects of excessive digitalization during the pandemic.

Keywords: Covid -19 pandemic, e-learning, digital eye strain, computer vision syndrome, insomnia, medical undergraduates

Introduction

World Health Organization declared ‘severe acute respiratory tract coronavirus-2‟ (SARS-CoV-2; also referred to as COVID-19)” outbreak as Global Pandemic on 11th March 2020. The global pandemic has imposed disastrous impacts on almost every aspect of life world over. Educational institutions world over including our country have been closed since March, 2020 as a part of nationwide lockdown to prevent the spread of the novel coronavirus

disease (COVID-19). The outbreak has changed the teaching learning methodologies across the world. The traditional teaching methods have been converted to digital device-assisted online classes.[1] e-learning has emerged as a saviour for current teaching and learning in schools, colleges and universities in almost all parts of the world.

The nationwide lockdown and "stay at home" orders imposed in response to the COVID-19 pandemic has made everyone to work from home. Consequently, everyone has been forced to spend their leisure time with screens. Technology has become the only tool for people to interact, communicate and continue their responsibilities. The human interaction has become virtual in the form of online meetings, audio, video conferencing, recreational activities like online gaming, blogging, social networking resulting in rapid upsurge in increased digitalization in every aspect of human life. Due to this pandemic, the students including medical undergraduates are forced to attend online lectures and study through digital devices as they have no more access to college or library. This has created an enormous spike in exposure time to mobile and other screens.[2] Different educational platforms like Google classroom, Zoom, Microsoft teams, etc are now being used by various educational institutions around the globe. Without any specific guidelines, it is now a usual routine for the medical undergraduates to spend most of the time (8–12 h per day) attending e-classes, gaming or having pleasure time in front of a computer or mobile screens.

Due to rapid increase in digitalization during the current pandemic, increase in time spent in front of video display terminals including desktops, computers, laptops, smart phones, television and e-readers has been observed. Increased use of video display terminals (VDTs) predisposes to variety of health problems restricted not only to visual problems but also include various musculoskeletal problems, collectively known as digital eye strain (DES) or computer vision syndrome (CVS).[3] Under such unanticipated circumstances digital eye strain/ computer vision syndrome may turn up as an emerging public health issue which can be responsible for substantial health problems. This may not only increase daytime stress, anxiety and depression levels, but also disrupt sleep. The main symptoms of CVS are eyestrain, headache, dry eyes sensation, blurred vision, tearing, burning of eyes, watering of eyes, photo phobia, red eyes, burning, itching, neck and shoulder pain, and contact lens troubles.[4,5] These devices cause harm by emitting short high energy waves that can penetrate eyes and can eventually contribute to photochemical damage to the retinal cells, making an individual vulnerable to a variety of eye problems ranging from dry eye to age-related macular degeneration.[3]

According to Sheppard et al, the prevalence of computer vision syndrome also known as digital eye strain in the community ranges from 22.3% to 39.8%.[6]

The prolonged measures of social confinement and isolation during COVID-19 pandemic is causing psychosocial problems as well as sleep disorders in all age group.

The circadian rhythm keeps us awake during the day and makes us sleepy at night. Light exposure affects melatonin release, a hormone which plays key role in inducing sleepiness. Bright light exposure during the day is said to increase melatonin release during night.

A study conducted in Italy reported that younger adults went to bed later and got up later during the peak of the pandemic, most likely contributing to a phase-delay type of insomnia.[7]

Thus it can be said that the above factors add up to a perfect recipe for insomnia and other sleep problems. When individual's body produces more of stress hormone cortisol it can keep body aroused, mind turning, and lead to fragmented sleep and insomnia. The blue light emitted by phone, tablet, computer, or TV disrupts the body's production of melatonin at night, a hormone that helps regulate the sleep-wake cycle.

Therefore it becomes imperative to assess the effect of computer vision syndrome on various aspects of sleep especially insomnia in medical undergraduates during the pandemic.

Aim & Objective

- To estimate the prevalence of computer vision syndrome among medical undergraduates taking online classes.
- To identify whether medical undergraduates suffered from sleep disorder like insomnia during Covid -19 pandemic.
- To assess the relationship between insomnia and computer vision syndrome in these students.

Material and methods

This study was a cross sectional study carried out in a Medical Institute in North India in November 2020. Since the students were subjected to observe social distancing as all educational institutes were temporarily closed and routine educational activities were in the form of online mode, the data was collected using online questionnaire on google form which was shared electronically with them.

Before filling the form, students were given brief description about the purpose of study, its objectives and brief instructions to fill the questionnaire. Students were allowed to proceed only if they agreed to participate in the survey. They were permitted to withdraw themselves at any stage if they were not willing to proceed. Students were assured of maintaining anonymity and confidentiality of their data. A pilot study was conducted among 10 undergraduate students before validating the final questionnaire.

Inclusion criteria

All the participants included in the study were normal healthy medical undergraduates of age ranging from 18 to 21 years and using various digital devices.

Exclusion criteria

Individuals suffering from congenital eye problems, any pre-existing medical or eye problems, using eye medicines and those who had undergone any kind of eye surgery were excluded from the study. Known case of dry eye, contact lens users, migraine, neurological ailments, and cervical spondylitis were also excluded from the study.

Prevalidated questionnaire by Segui et al[8] was used to assess the level of computer vision syndrome symptoms. The questionnaire included (i) demography details, (ii) spectacles use, (iii) computer use, (iv) symptoms of computer vision syndrome, (v) any measures practiced to prevent eye problems, (vi) use of radiation filter, and (vii) lighting in the room.

Insomnia was assessed using the Insomnia Severity Index (ISI) questionnaire. *Insomnia Severity Index (ISI)* is a brief self-administered seven-item questionnaire that assesses perception of both nocturnal and diurnal symptoms of insomnia.[9] The seven items enquire about night-time sleep as well as daytime functioning and quality of sleep. Each item is scored on a five-point Likert scale with scores ranging between 0 and 28. 0–7 a prior threshold indicating no clinically significant insomnia, 8–14 indicating subthreshold insomnia, 15–21 indicating clinical insomnia with moderate severity, and 22–28 indicating clinical insomnia with severe severity.[10]

Statistical Technique Used:

The filled questionnaire was collected. Data was tabulated in an excel sheet. Compilation of the data was done on Microsoft Excel. Statistical analysis done by SPSS, Microsoft Excel.

Result

This study included 150 medical undergraduates from a medical college in North India (70 females and 80males) in the age group of 18-21years.

Table 1: Demographic characteristics and details of digital device usage

Demography	Number (%)
Mean age	19±2.4 yrs
Male:Female	80 males: 70 females
Duration of digital devise usage (pre- COVID era)	
<5 h	132 (88%)
>5 h	18 (12%)
Duration of digital device usage (COVID era)	
<5 h	30 (20%)
>5 h	120 (80%)
Online classes attended	150 (100%)
Duration of online class	
<1 h/day	0 (0%)
1-2 h/day	10 (6%)
>2 h/day	140 (94%)
Use of television	
Not watching	12 (8%)
<1 h	55 (36%)
1-2 h/day	79 (53%)
>2 h/day	4 (3%)
Use of smart phone for playing games	
Not using	3 (2%)
<1 h	56 (37%)
1-2 h/day	84 (56%)
>2 h/day	7 (5%)
Distance of digital device from eyes during online classes	
<18 inches	49 (33%)
>18 inches	101 (67%)

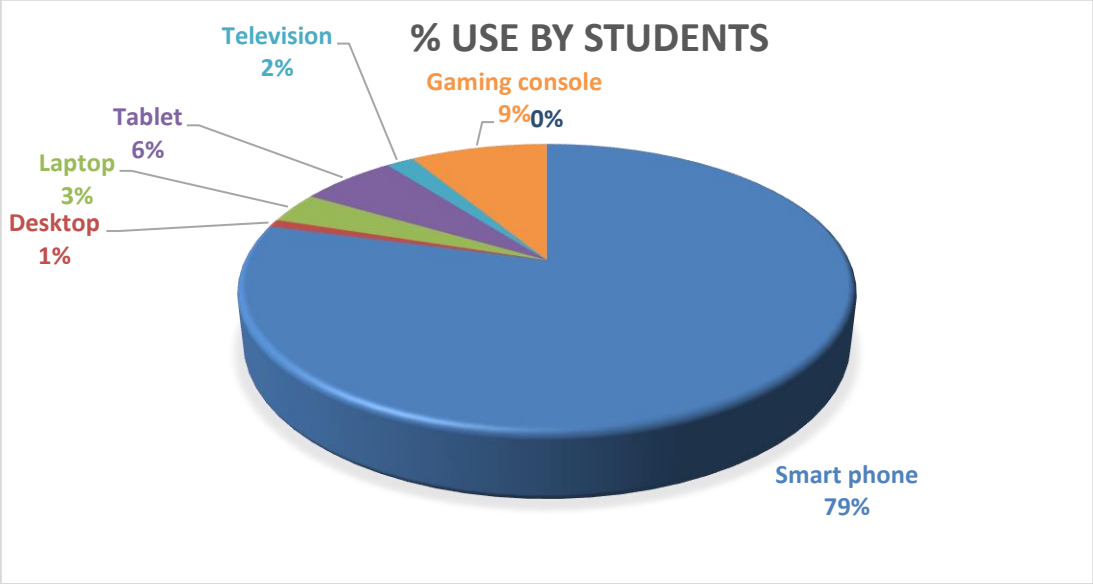

Figure 1: Shows the percentage of students using different digital devices. Smart phone being the most common device and desktop the least.

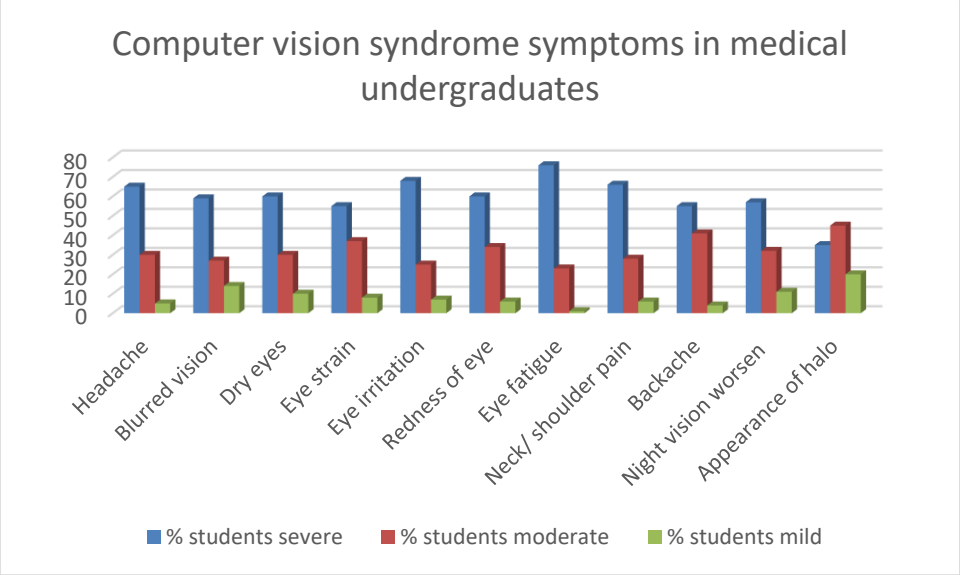

Figure 2: Shows various computer vision syndrome symptoms seen in the medical undergraduates.

Most common ocular complaint reported was eye fatigue followed by eye irritation and headache. Neck/ shoulder pain was the most common non-ocular complain among these students.

Table 2: t-Test: Paired Two Sample for Means for duration of digital device used during pre COVID & COVID era

	Duration (pre- COVID era)	*Duration (COVID era)*
Mean	2.833333333	9.926666667
Variance	2.502237136	19.31673378
Observations	150	150
Pearson Correlation	0.568749227	
P(T<=t) one-tail	7.95814E-52	

The study shows increase in the mean duration of digital device usage from 2.8hours during pre- COVID era to 9.9hours during COVID time. The increased prevalence of Computer vision syndrome in the current study is probably due to the increased visual demand of digital device use by the subjects because of the online classes in this COVID era while following the government protocol of lockdown and social distancing. Taking breaks in between the use of computer (68.8%) was the most common preventive measure taken for relief of symptoms of CVS; the mean duration of time taken was 15 minutes (range 5 – 60 minutes). However, there was no statistically significant association between taking breaks during the use of computer and relief of symptoms.

Looking at distant objects in-between the screen exposure, eye massage and use of eye drops were found to be useful in reducing the CVS symptoms.

Majority of students (70%) were not using any radiation reducing filter on the monitor. Though the use of this filter did not help the students in reducing the symptoms of CVS.

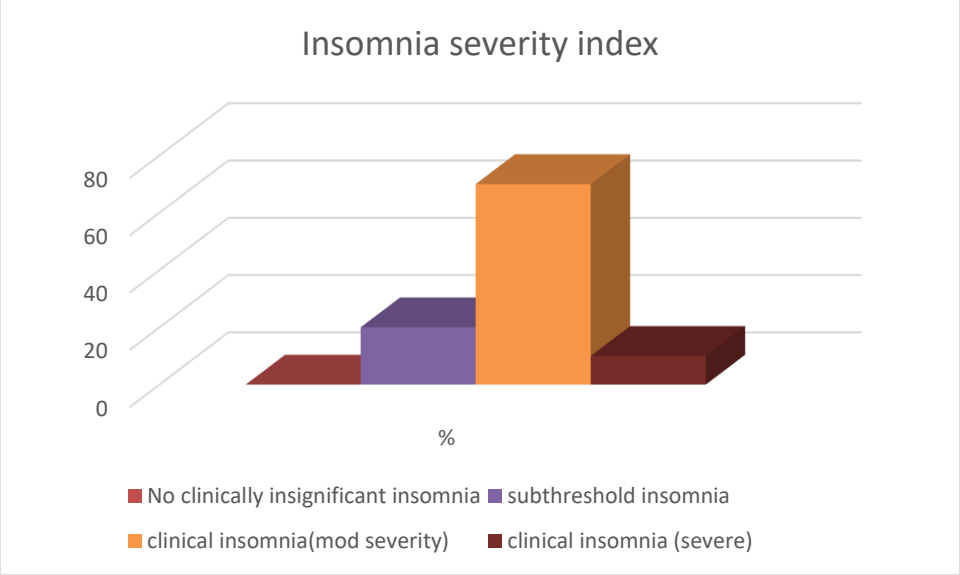

Figure 3: Insomnia severity index in medical undergraduates. 70% students having clinical insomnia of moderate severity.

Discussion

Educational institutions world-over including our country have been closed since March, 2020 to halt the spread of the novel coronavirus (COVID-19) disease. Since there is no immediate solution to stop the spread of the COVID pandemic, the closure of schools and colleges has affected the teaching learning in all age groups. This outbreak has changed the traditional teaching method to digital device-assisted online classes. The new e-learning system requires an extra time of sitting in front of a digital device. In the current study, the most common digital device used by the medical undergraduates was smartphone and desktop being the least common device used for online classes. Television was one of the main source of entertainment after being confined to home during the pandemic.

Spending long hours in front of these devices can lead to many ocular problems in all age groups. The high visual requirements and visual attention makes any computer/ digital screen user susceptible to develop Computer vision syndrome(CVS) or Digital eye strain (DES).[11] Loh K et al [4] stated that the pathophysiological mechanisms of CVS can be: extra ocular mechanism, accommodative mechanism and ocular surface mechanism.

The four categories of symptoms of computer vision syndrome are: i) asthenopic – sore eyes, eye strain, (ii) ocular surface related- dry eye, irritation, watering, (iii) visual – double vision, blurred vision, slowness of focus change iv) extra ocular – shoulder pain, neck pain, back ache.

According to Kiraly O [12] there has also been increased digitalization for recreational purposes by one and all. Possible reason for increased frequency of computer vision syndrome could be that this study was conducted during COVID-19 pandemic when increased digitalization has been observed in every field of life. Students are subjected to the use these devices for long time without break as they were shifted to online teaching-learning sessions. In the current study, maximum participants were found to have severe eye fatigue followed by irritation of eyes. These ocular symptoms can be attributed to the back to back online classes as well as too much screen exposure due to home confinement.

Reduced blink rate is also associated with asthenopic sore eyes and eye strain. It has been reported that blink rate during computer use reduces to 3.6 blinks/min as compared to normal mean blink rate i.e. 18.4 blinks/ min.[13]

Mutti and Zandic in 1996 reported about pronounced visual symptoms in people spending 6-9 hours daily at a computer[14], while Stella et al in 2007 observed the same in people using computer more than 8 hours daily.[15] Spending long time on the computer screen without pause also can lead to problem of shifting focus on screen, documents and keyboard. Wimalasundara S found that the constant process of drifting and refocusing on fuzzy pixel of texts on the screen can leave eyes strained and fatigued. [16] In the present study severe neck/ shoulder pain was the most common non-ocular complain and this can be attributed to the posture taken while attending long hours of online classes by these students

In the present study, the participants who took break, experienced less frequent symptoms however; there was no significant association between frequency of breaks and relief of symptoms. This is in sync with the study done by Ranasinghe P et al [17], which supported the evidence that taking break do not relief the symptoms associated with CVS. Mc Lean et al mentioned that taking regular small breaks may relax accommodation process of the eyes, thereby preventing eye strain.[18] Taking breaks in between the use of computer was the most common preventive measure taken for relief of symptoms of Computer vision syndrome.

Study conducted by Shrivastava et al in 2012 also reported that the visual symptoms aggravated with increase duration of hours spend on computer[19] Rahman and Sanip in their study documented that more than 7 hours of computer usage is significantly associated with symptoms of CVS. [20] Another study done in India, reported the results in accordance with our study in which the ocular symptoms including eye strain, itching and burning are more common in computer users more than 6 hours.[21] While Stella et al. reported that CVS symptoms are more common in people using computer for more than 8 hours daily.[15] American Optometric Association has also recommended the minimum viewing distance to be 20–28 inches.[10]

Insomnia is said to be highly prevalent and even contributes significant burden in terms of functional impairment in day-to-day life, health care costs, and increased risk of depression. Despite its high prevalence and significant morbidity, insomnia often remains unrecognized and untreated. Identifying clinically significant insomnia is also important to intervene early and reduce morbidity as well as mortality. In one of the study Voitsidis P in 2020 found that sleep parameters are influenced by a number of sociodemographic factors including sex, age, income status, and current personal worries.[22] They mentioned that COVID-19 related worry, has also been associated with insomnia.

Brief and valid questionnaire facilitates the initial screening and formal evaluation of insomnia. Clinical evaluation though, will remain the gold standard for making a valid insomnia diagnosis. Insomnia severity index questionnaire was used in the present study to assess whether the participants had any sleep loss or insomnia during this stressful pandemic. It was really surprising to find that not a single medical undergraduate had clinically insignificant insomnia during this study. 70% students reported with clinical insomnia of moderate severity whereas 10% students had severe clinical insomnia.

Since the current study was cross-sectional, author cannot confirm that insomnia amongst medical undergraduates is solely due to excess screen usage causing computer vision syndrome or any other underlying cause. Various psychological parameters can be taken into consideration to find out the 'Cause and Effect' relationship. However, the associations between digital eye strain/ computer vision syndrome with insomnia, the most common and neglected sleep disorder, can't be ignored.

Limitations of this study include a cross-sectional study design conducted in a single institution, and computer vision syndrome/ digital eye strain diagnosed based on self-reported symptoms without ophthalmic examination. Other population groups were not included. Since data was collected using self-reported questionnaire, it can be potential source of bias. Moreover, as it was a cross sectional study so it was difficult to establish causal association

between risk factors and disease. Even then, the results of this study can provide baseline data to stakeholders to devise effective strategies to reduce its rapid upsurge during pandemic.

Study was with a very small sample size. True prevalence and factors associated with digital eye strain/ computer vision syndrome can be efficiently found out by prospective community-based study.

Conclusion

As medical universities continuously reform their educational methods, there is a need to provoke awareness amongst students concerning their health effects allied to prolonged usage of computers and mobiles for studying during the current pandemic. Preventive measures to reduce CVS associated symptoms should also be imparted. Intermittent exposure to digital screens with considerable refreshing breaks in-between online classes can be helpful in preventing CVS. Online teaching classes can be scheduled for lesser duration for the benefit of students. The students must be advised to monitor their screen time. Also, they must be well notified and hence be aware of the adverse effects of prolonged digital screen usage.

There is dire necessity to address this burning public health issue by sensitizing our young generation about deleterious health effects associated with excessive use of digital devices. There is also an urgent need to make an institutional policy involving all stakeholders to devise effective strategies to prevent young generation from its detrimental health effects of excessive digitalization during the pandemic.

Acknowledgment:

Author would like to thank all the medical undergraduates who responded patiently, without their cooperation this work would not have been possible.

References

1. Available from: https://government.economictimes.indiatimes.com/ news/education/ covid-19-pandemic-impact-and-strategies-foreducation-sector-in-india/75173099.
2. Bhattacharya S, Saleem SM, Singh A. Digital eye strain in the era of COVID-19 pandemic: An emerging public health threat. Indian J Ophthalmol 2020;68:1709-10.
3. Madhan MRR. Computer vision syndrome. Nurs J India 2009;100:236-7.
4. Loh K, Reddy S. Understanding and preventing computer vision syndrome. Malaysian Family Physician. 2008;3(3): 128-30.
5. Hazarika A, Singh K. Computer vision syndrome. SMU Medical Journal. 2014;1(2):132-8.
6. Sheppard AL, Wolffsohn JS. Digital eye strain: Prevalence, measurement and amelioration. BMJ Open Ophthalmol 2018;3:e000146
7. Cellini N, Canale N, Mioni G, et al. Changes in sleep pattern, sense of time, and digital media use during COVID-19 lockdown in Italy. J Sleep Res 2020 May 15: e13074.
8. Seguí MdelM, 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. (CVS Proforma)
9. Morin CM, Belleville G, Bélanger L, Ivers H. The insomnia severity index: Psychometric indicators to detect insomnia cases and evaluate treatment response. Sleep 2011;34:601-8.
10. Bastien CH, Vallières A, Morin CM. Validation of the insomnia severity index as an outcome measure for insomnia research. Sleep Med. 2001; 2: 297–307.
11. American Optometric Association. Computer Vision Syndrome (CVS); 2017.(Accessed 8October2017)Available:https://www.aoa.org/patientsand-public/caring-for-yourvision/ protecting-your-vision/computervision- syndrome

12. Király O, Potenza MN, Stein DJ, King DL, Hodgins DC, Saunders JB, et al. Preventing problematic internet use during the COVID-19 pandemic: Consensus guidance. Compr Psychiatr. 2020; 100: 152180.
13. Association AO**.** The effects of computer use on eye health and vision. Internet: http://www. aoa. org/documents/Effects Computer Use. pdf [02 August 2011], 1997. Accessed on 4 November 2020.
14. Mutti D, Zadnik K. Is computer use a risk factor for myopia? J Am Optom Assoc; 1996).67:521-530.
15. Stella C, Akhahowa AE, Ajayi OB. Evaluation of vision related problems among computer users: A case study of University of Benin, Nigeria. Proc of World Cong on Engeneering (WCE) 2007, July 2-4, London.
16. Wimalasundera S. Computer vision syndrome. Galle Med J 2006;11:25-9.
17. Ranasinghe P, Wathurapatha WS, Perera YS, Lamabadusuriya DA, Kulatunga S, Jayawardana N, Katulanda P. Computer vision syndrome among computer office workers in a developing country: an evaluation of prevalence and risk factors. BMC research notes, 2016; 9: 1.
18. Mc Lean L, Tingley M, Scott RN, Rickards J. Computer terminal work and the benefits of microbreaks. Applied Ergonomics 2001;32: 225-237.
19. Shrivastava SR, Bobhate PS. Computer related health problems among software professionals in Mumbai: A cross-sectional study. Int J Health Sci. 2012; 1: 74–8.
20. Rahman ZA, Sanip S. Computer user: Demographic and computer related factors that predispose user to get computer vision syndrome. Int J Bus Humanit Technol. 2011; 1: 84–91.
21. Agarwal S, Goel D, Sharma A. Evaluation of the factors which contribute to the ocular complaints in computer users. J Clin Diagn Res. 2013; 7: 331-5.
22. Voitsidis P, Gliatas I, Bairachtari V, Papadopoulou K, Papageorgiou G, Parlapani E, et al. Insomnia during the COVID-19 pandemic in a Greek population. Psychiatry Res. 2020;289.