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ORIGINAL ARTICLE

Online medical teaching during COVID-19 pandemic: Ocular, mental, and ergonomic effects

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Abstract

Purpose: To deliver educational curriculum to students, online learning has emerged as a new modality of teaching during COVID-19 pandemic. The aim of this study was to document the ocular, ergonomical, and mental health issues among undergraduate medical students due to online teaching programs.

Methods: This cross-sectional observational study undertook an e-survey for undergraduate medical students. An online survey link was mailed to students. A follow-up survey with same questions was mailed 6 months later to same set of students and responses were compared.

Results: About 201/385 (52.2%) students responded to the first survey, 212/385(55.06%) students responded to follow-up survey. The mean age of the study population was 21.42 ± 1.69 years. About 34.8% students spent more than 4 h/day on online classes in primary survey in comparison to 52.3% students in the follow-up survey. The follow-up survey had a significant increase in number of students with eye strain as compared to primary survey (78.77% vs. 52.2%). Nearly, two-third of participants in both surveys had increase in body weight due to prolonged sitting. About 79% of participants in both surveys had disturbed sleep patterns, and around 72% experienced depression and loneliness.

Conclusion: Regular and prolonged usage of e-learning platforms can have a deleterious effect on health. Modification of the learning environment and measures such as frequent blinking, correct posture, and healthy interaction with peers can mitigate these symptoms.

Introduction

The COVID-19 pandemic has brought into focus various aspects of health among both the affected and non-affected population. Health calamities include epidemics and pandemics accentuate as well as create new stress factors such as change in lifestyle, restrictions on physical movements, and social interactions due to quarantine. A recent study on virus outbreaks and pandemic has documented fear, frustration, boredom, financial burdens, and loss of education as major stressors.[1] Change in the way that the medical students are taught is one of the many drastic changes, COVID-19 pandemic has brought about. While education and learning have been hampered at all levels, from schools to graduation institutes, none holds more importance in current scenario than the medical curriculum. Putting medical education at hold puts into jeopardy the number of doctors that are supposed to graduate and subsequently serve in hospitals, as interns and later on as postgraduates. The pandemic has surely brought into focus the severe shortage of medical personnel.

As a result, online or e-learning has been adopted as a teaching-learning method in the current medical curriculum.[2] Electronic devices, laptops, tablets, phablets, and smartphones are now an integral part of the student's armamentarium.[3]

Online learning with implementation of the advanced technology facilitates direct student and teacher interaction with better sharing of the study material.[4] Students gain access to knowledge from the comfort of their homes, without facing risk of exposure in a public space (college). As quoted, in every seed of good, there is always a piece of bad, e-learning has its own

set of limitations too. The most frequently occurring health-related problems include the computer vision syndrome (CVS), wrist, neck, shoulder, and back pain, psychological, and sleep disturbances, an over use syndrome resulting in other ocular and musculoskeletal discomfort.[5]

CVS is characterized by a range of eye and vision-related symptoms. The terms visual fatigue (VF) and digital eye strain (DES) are used interchangeably to include other digital devices such as smartphones and tablets. The literature reports the prevalence of CVS to be 89.9% among university students, which increases with >2 h computer use.[6] According to the American Optometric Association, the most common symptoms associated with DES are eyestrain, headaches, blurred vision, dry eyes, and pain in the neck and shoulders.[7]

The combination of visual and neck symptoms in CVS is interesting as the neck has a high percentage of proprioceptors that trigger reflexes in the eyes and the inner ear and allows for precise control of head and eye movements, as well as posture.[8] The visual ergonomics of the computer environment influence both the visual system and musculoskeletal structures around the neck presenting as pain in the back and ears. e-learning as a part of sedentary lifestyle among adolescents has led to lack of physical movements manifesting as weight gain.[9]

Mental health is a leading deterrent to academic success, as it can affect both motivation and concentration. Overuse of electronic gadgets as a part of e-learning is associated with poor mental health and behavioral patterns like depression.[10] Recent literature on psychological impacts of COVID-19 has emerged from the earliest hot spots in China. Although several studies in the past have addressed mental health issues during epidemics, the prime focus group has been the health workers, patients, children, and the general population.[11]

A medical student can spend an average of 4–6 h/day studying with full concentration without having to encounter any health-related issues. More than 6 h of study are associated with decreased output and health problems.[12] Online classes have further added to the already high screen time during the COVID-19 pandemic. The literature is sparse on the impact of e-learning during pandemic on various health aspects among the undergraduate medical students.[13] This section of population is the most vulnerable populations and thus there is a need to assess effects of the e-learning during the current pandemic on the health and well-being of undergraduate medical students.

To address this concern, we administered an online questionnaire comprising of 10 questions to the undergraduate medical students studying in various government and/or private medical colleges of North India and recorded their responses followed by a follow-up survey 6 months later to compare the responses. No other surveys have reported all three important health issues related to e-learning for Indian undergraduate medical students.

Methods

The study followed the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) guidelines.[14]

Study design

This was a cross-sectional and observational study involving undergraduate medical students. A structured questionnaire [Figure 1] was sent to 385 undergraduate medical students studying in various government and/or private medical colleges of North India through electronic mail in September, 2020, 4 months after the initiation of online classes. The sample size was calculated using the Cochran's formula assuming 95% confidence level and 0.5% precision with symptoms prevalence of 60% as reported previously. Since the COVID-19 pandemic continued and the physical classes did not resume, therefore, the same survey was mailed to the same set of students 6 months after the first survey closed (March 2021) and the results were compared to see the effects of prolonged e-learning.

Full confidentiality of the particulars of the participants was maintained. Participation in the study was anonymous and voluntary. No personal data were collected. The survey's instructions informed the enrollees that, by completing the survey, they gave consent to take part in the research and the data obtained would be processed anonymously in aggregate statistical summaries. The authors did not enroll medical undergraduates from their institute so as to eliminate any bias, therefore, IRB permission was not taken.

Designing the survey and logic operations

The questionnaire consisting of 10 questions apart from the demographic details was structured. A web platform survey hosted by So go Survey (Herndon, VA, USA) was used to make this questionnaire available to the students. The online survey was pretested on 10 undergraduate medical students from different medical institutes to avoid any bias. The average time for filling the survey was 2 min. This data were not analyzed in the final results. The link for the same was emailed to the medical students using the mail address of the principal investigator (ES). The questionnaire was further categorized into three subcategories covering the ocular, ergonomical, and mental aspects of health. The feedback was elicited using Likert scale comprising five responses: (1) Strongly disagree, (2) disagree, (3) uncertain, (4) agree, and (5) strongly agree.

The survey was open to all participants, who fulfilled the two eligibility criteria: Currently, an undergraduate medical student, not having passed final professional examinations, and regularly

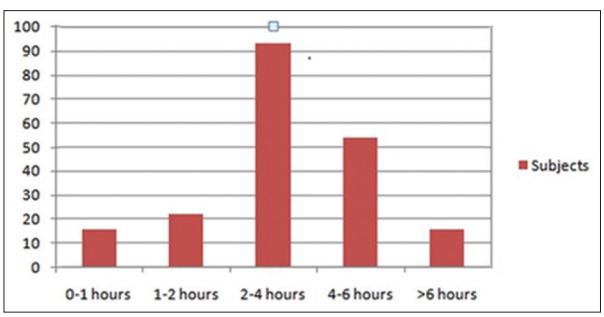

Figure 1: Questionnaire used for primary and follow-up study

attending online classes. No incentives were offered to improve response rate. No participant was personally contacted outside this internet-based survey. The survey link was also shared on social media platforms such as WhatsApp and Facebook Messenger, for interested candidates who were referred by their colleagues for participation. The participants had an option to review their responses before submitting but once uploaded on the website, the responses to the questionnaire could not be altered. Both the surveys were open for responses for 1 month after which it was closed and the data analyzed. Two reminders were sent over the month.

Only one submission per student was allowed. Website used authentication cookies at log in and no IP addresses were collected from the participants. Anonymity was assured by password protection of the survey account.

All analyses and statistical tests were conducted using SPSS version 21.0 (SPSS Inc., Chicago, Il, USA). Simple descriptive statistics were used to generate frequencies, percentages, and proportions.

Results

Two hundred and one out of 385 undergraduate medical students responded to the first survey resulting in a survey yield of 52.20%, whereas 212 out of 385 responded to the follow-up survey resulting in a survey yield of 55.06%. The basic demographic profile of students for both surveys is shown in Table 1.

Table 1: Basic demographic data of study population

	Primary survey	Follow-up survey
Number of students	201	212
Gender		
Male	89	96
Female	112	116
Mean age (years)	21.42	21.42
Minimum	18	18
Maximum	26	26
MBBS		
1st prof	53	50
2nd prof	33	34
3rd prof	49	52
Final year	66	76
Number of hours spent online (h)		
<2	38	30
2–4	93	68
4–6	54	94
>6	16	20
Mode of e-learning		
Smartphones	133	136
Computers/laptops	68	76

Questionnaire response

Ocular aspects

In the primary survey, 105 students agreed to the fact that in post online classes, they have experienced an increase in the eye strain (52.2%). The follow-up survey had a significant increase number of students (78.77%) reporting increase in eye strain. Hundred (49.75%) students agreed that long hours of online classes resulted in eye problems such as burning sensation and irritation in eyes, this complaint was found to be more (66.9%) in the follow-up survey. Regarding the role of anti-glare glasses in symptoms prevention, the majority of the students were uncertain in both the surveys (59.2%). Out of 201 participants, 105 students wore glasses and out of them 43 had change in the power of their spectacles post-online classes in the first survey whereas 106 students wore glasses in the follow-up survey and 45 had got the power of their spectacles changed.

Ergonomical aspects

In the primary survey, 167 (83.08%) students agreed to having an increase in neck pain and backache after starting online classes. A similar percentage (83.01%) was noted in the follow-up survey. Ninety nine (45.27%) and 102 (48.11%) students experienced discomfort and pain in the ears because of the use of earphones during online classes in the primary and follow-up survey, respectively. Nearly, two-third students in both primary (151/201; 75.12%) as well as follow-up (164/212; 77.3%) survey were certain that they had increase in their body weight due to prolonged sitting.

Mental/psychological aspects

The social interaction with peers and teachers has decreased due to online classes leading to increase in the incidence of depression and loneliness. One hundred and forty-four students agreed to this fact (71.6%) in the primary survey and 154 (72.6%) students in the follow-up survey. Ninety-four students in both the surveys disagreed to the statement that there was better understanding and retention of the subject matter through e-learning from the comfort of their home. In the primary survey, 157 (78.1%) students firmly believed in the fact that increased time spent online has led to disturbed sleep patterns with almost similar percentage (79.2%) reported in the follow-up survey. The detailed results are elucidated in Tables 2 and 3.

Discussion

This article addresses the symptoms of a new ocular pandemic, "*e-learning vision syndrome*" (EVS), the prevalence of which has increased during COVID-19 pandemic. The symptoms of the CVS can broadly be divided into four major sub-categories, that is, asthenopia, ocular surface related, visual, and the extraocular.[15]

Human eyes have a different focusing mechanism for the printed text versus the visually displaced text on screens. The printed text is made of a uniform character whereas the visually

Table 2: Primary responses to questionnaire

Questions	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
	1	2	3	4	5
Ocular problems					
There is increase in eye strain after you started attending online classes	6	12	26	105	52
Long hours of online classes cause burning sensation and irritation in eyes	6	15	44	100	33
Use of anti-glare glasses help in resolution of symptoms	6	19	119	50	7
There is increase in power of glasses after starting online classes	13	28	55	77	28
Ergonomic problems					
Excessive sitting has led to an increase in neck and back pain	7	14	13	100	67
Prolonged used of earphones has led to discomfort and pain in ears	7	16	24	99	55
Due to prolonged sitting, there is an increased in incidence of weight gain	5	29	16	80	71
Mental problems					
Decrease in social interaction with peers and teachers has led to increase in the feeling of depression and loneliness	8	22	27	81	63
There is better understanding and retention of the subject during online classes as you can attend it in your comfort zone	42	52	32	54	21
Increased computer time has led to disturb sleep pattern among students	10	16	18	87	70

displaced text is made of pixels which are formed when an electronic beam strikes the phosphor-coated screens. The human eyes have a difficulty in focusing at these pixels because of the lack of uniformity in their character, that is, they are brightest at the center with decreasing brightness toward the periphery.[16] As a result, there is lag between the focusing apparatus and the screen. The repetitive focusing and refocusing of the eye by the ciliary body results in fatigues and accommodative symptoms. The lag of accommodation, in turn, leads to visual symptoms. The inadequate viewing position of the screens and the required adjustments for desired focusing leads to extraocular symptoms.[15] Likewise, ocular surface related symptoms such as irritation and burning in eyes can be explained by decreased blink rate caused due to prolonged screen time. As a result, there is tear film instability with resultant damage to corneal epithelium which, in turn, stimulates nerve endings leading to ocular discomfort.[17]

Eye strain is the most frequent complaint of the computer users specially people who spend >6 h on screens.[18] The same was consistent with our survey where 52.2% of students complained of increase in eye strain post-starting online classes. A similar incidence of 40.3% eye strain was documented by an online questionnaire conducted on medical students in Jamaica.[3]

There is a strong relation between the hours of screen usage and the CVS symptomatology. Different authors have documented different results. Reddy *et al.*[6] published that >2 h of screen time were associated with occurrence of CVS. Sanchez-Roman *et al.*[19] found eye strain in 68.5% of individuals using computer for >4 h/day. Nakazawa *et al.*[20] reported a threshold of 5 h/day and found it to be linearly related with physical symptoms. Logaraj *et al.*[21] documented that 4–6 h/day of screen time was associated with increased symptoms than <4 h/day of screen time. Dost *et al.* in their survey among medical students of UK reported an average of >15 h/week of screen time.[22] In our primary survey, 34.82% of students who had a screen time of >4 h/day (which amounts to >28 h/week) strongly agreed to the fact that there was an increase incidence of eye strain. However, in the follow-up survey, 44.33% students had an increase in screen time averaging to >4–6 h/day. A probable reason for this increase could be the final examinations during this 6-month period resulting in additional sitting hours.

Nearly, half (49.75%) of the students in the present survey complained of neck pain and backache. Mowatt *et al.*[3] in their study reported an incidence of 75.1% of neck pain. Different studies conducted at different places reported prevalence of neck pain and backache ranging from 24 to 49%.[23-25] Incorrect posture and long screen time may account for these findings thus

Table 3: Responses to questionnaire on follow-up survey

Questions	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
	1	2	3	4	5
Ocular problems					
There is increase in eye strain after you started attending online classes	7	12	26	108	59
Long hours of online class causes burning sensation and irritation in eyes	6	15	46	102	40
Use of anti-glare glasses help in resolution of symptoms	6	20	121	54	11
There is increase in power of glasses after starting online classes	14	32	57	77	32
Ergonomic problems					
Excessive sitting has led to an increase in neck and back pain	7	14	15	107	69
Prolonged used of earphones has led to discomfort and pain in ears	7	16	30	102	57
Due to prolonged sitting, there is an increased in incidence of weight gain	4	26	18	92	72
Mental problems					
Decrease in social interaction with peers and teachers has led to increase in the feeling of depression and loneliness	7	21	30	85	69
There is better understanding and retention of the subject during online classes as you can attend it in your comfort zone	46	48	36	52	28
Increased computer time has led to disturb sleep pattern among students	9	14	21	93	75

emphasizing the need for maintaining the appropriate and non-slouching posture during online classes.

In the present survey, 55.7% of the survey population comprised of females who had increase in the incidence of extraocular symptoms of CVS. The reason for the same could be the relatively shorter stature of females as compared to their male counterparts affecting their arm length thus affecting the reading distance. Relatively, shorter height may force the females to adapt a chin up position especially for the table mounted computers leading to an increase in the musculoskeletal symptoms. Mowatt *et al.*[3] have also reported a similar increase in the prevalence of symptoms among females.

The literature on whether the handheld devices such as smartphones, phablets, or tablets cause more ocular and visual discomfort is controversial. The smartphones have a different viewing position and distance, screen size, and luminance. Tablets, laptops, and smartphones affect accommodation as well as the blink rate.[26] Park *et al.*[27] reported a decrease in blink rate post 60 min of using smartphone whereas Golebiowski *et al.*[28] reported increase in the blink rate after 60 min of reading on smartphones. In our survey, 66.2% of the students used smartphones as a means of e-learning and majority of them strongly experienced ocular symptoms. This difference of opinion in the literature calls for the future research to conclude whether smartphones or computers have more deleterious effect on eyes. Sarkar *et al.*[29] evaluated adverse health effects of smartphone use in medical students. They noted that 43% medical students faced medical problems such as tingling in fingers (10%), inability to sleep (2.5%), anxiety (9.5%), and loss of concentration (47.6%). A previous study had also concluded that excessive use of smartphones was related to poor quality of sleep.[30]

The psychological impact of the COVID-19 has taken a toll on the mental health of students. In our survey, 40.2% students experienced loneliness and depression due to social distancing. About 78.2% of the students agreed to the fact that they have had a disturbance in the sleep patterns. Our findings were consistent with the findings of an interview survey among 195 college students where 44% students experienced increased stress and anxiety whereas 86% experienced disturbed sleep patterns.[13] A similar study assessing the students' perspective to online teaching in Poland found 40% of the students reporting an increased incidence of social isolation post-e-learning.[31] A large scale study comprising 41,781 individuals quantified the association between psychological issues associated with smartphone usage.[10] They reported an increase in the odds of depression, stress, and disturbed sleep pattern. The prevalence of mental health related issues associated with excess screen time is on rise. Primary prevention is difficult considering that these gadgets have become a part of societal norm. Hence, the need of the hour is to increase awareness among individuals and remedial steps to prevent health-related issues.

Bączek *et al.*[31] surveyed 804 students regarding their perception of online learning during COVID-19 and concluded

that e-learning was less effective than the traditional teaching, in terms of clinical and social skills. The students reported being less active during the online classes. Likewise, 46.7% (nearly half) of the students in our study preferred the traditional teaching practice as opposed to the e-learning. Adding video-based content teaching instead of just text-based evidence may prove beneficial in this regard as stated by the Peyton's[32] 4-step skill acquisition approach. As per this model, the teacher initially conducts a silent demonstration followed by repetition with detailed description of necessary sub-steps (deconstruction). Afterward, the student has to explain each sub-step with teacher following the student's instructions (comprehension). The conclusive step is performance whereby the students perform the complete skill in addition to describing the same and this is not feasible for teaching all students taking online classes.

With the current scenario, the medical learning is likely to remain affected in the near future. The need of the hour is to implement multimodal teaching strategies and introduce interactive tools such as vote polls, chats, and one-line quizzers that can make the e-teaching more effective. The psychological depression and isolation can be combated by creating mentor groups where seniors can address the apprehension of juniors and guide them. These groups need not be created by the teachers but can be created by students to address their concerns and help find solution to their fears.[33]

Other measures that may be tried out include allowance of 5–10 min of break between classes, during which students may be encouraged to walk around their rooms or made to stand up and do stretching. Reminders for frequent blinking can also be given. Such activities can promote physical movement and prevent the schedule from getting mundane. Importance of good posture should also be emphasized.

Chief limitation of our survey was that we could not get the desired number of responses as calculated although more than 50% of the students responded. Second, we did not define the exact numerical value of gain in weight to consider it enough; we left it on the medical students to answer in affirmative if they considered that their quarantine weight was more than that in pre-quarantine error.

Conclusion

Long hours of online classes affect physical as well as mental health. By modifying the environment and educating the students, the symptoms of CVS can be prevented. Imparting knowledge regarding frequent eye blinking, taking breaks, maintaining a correct posture, and the appropriate distance at which the device should be held can be some of the useful interventions.

References

1. Brooks SK, Webster RK, Smith LE, Woodland L, Wessely S, Greenberg N, *et al.* The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. Lancet 2020;395:912-20.
2. Sandhu P, de Wolf M. The impact of COVID-19 on the undergraduate medical curriculum. Med Educ Online 2020;25:1764740.
3. Mowatt L, Gordon C, Santosh AB, Jones T. Computer vision syndrome and ergonomic practices among undergraduate university students. Int J Clin Pract 2018;72:e13035.
4. Thanji M, Vasantha S. ICT factors influencing consumer adoption of ecommerce offerings for education. Indian J Sci Tech 2016;9:1-6.
5. Muthunarayanan L, Madhu PV, Seetharaman N, Shailendra KH. Practice of ergonomic principles and computer vision syndrome (CVS) among undergraduates students in Chennai. Natl J Med Res 2013;3:111-6.
6. Reddy SC, Low CK, Lim YP, Low LL, Mardina F, Nursaleha MP. Computer vision syndrome: A study of knowledge and practices in university students. Nepal J Ophthalmol 2013;5:161-8.
7. American Optometric Association. Computer Vision Syndrome; 2017. Available from: https://www.aoa.org/patients-and-public/caring-for-yourvision/protecting-your-vision/computer-vision-syndrome? [Last accessed on 2020 Oct 20].
8. Della Casa E, Affolter Helbling J, Meichtry A, Luomajoki H, Kool J. Head-eye movement control tests in patients with chronic neck pain; inter-observer reliability and discriminative validity. BMC Musculoskelet Disord 2014;15:16.
9. Cao H, Sun Y, Wan Y, Hao J, Tao F. Problematic Internet use in Chinese adolescents and its relation to psychosomatic symptoms and life satisfaction. BMC Public Health 2011;11:802.
10. Sohn S, Rees P, Wildridge B, Kalk NJ, Carter B. Prevalence of problematic smartphone usage and associated mental health outcomes amongst children and young people: A systematic review, meta-analysis and GRADE of the evidence. BMC Psychiatry 2019;19:356.
11. Lai J, Ma S, Wang Y, Cai Z, Hu J, Wei N, *et al.* Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. JAMA Netw Open 2020;3:e203976.
12. Liles J, Vuk J, Tariq S. Study habits of medical students: An analysis of which study habits most contribute to success in the preclinical years. MedEd Publish 2108;7:61.
13. Son C, Hegde S, Smith A, Wang X, Sasangohar F. Effects of COVID-19 on college students' mental health in the United States: Interview survey study. J Med Internet Res 2020;22:e21279.
14. Eysenbach G. Improving the quality of web surveys: the checklist for reporting results of internet e-surveys (cherries). J Med Internet Res 2004;6:e34.
15. Alemayehu AM, Alemayehu MM. Pathophysiologic mechanisms of computer vision syndrome and its prevention: Review. World J Opthalmol Vision Res 2019;2:547.
16. Chang PC, Chou SY, Shieh KK. Reading performance and visual fatigue when using electronic paper displays in long duration reading tasks under various lighting conditions. Displays 2013;34:208-14.
17. Weisenthal R. Basic and Clinical Science Course (BCSC): External Disease and Cornea. Sec. 8. San Francisco: American Academy of Ophthalmology; 2016.
18. 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.

19. Sanchez-Roman FR, Perez-Lucio C, Juarez-Ruiz C, Velez-Zamora NM, Jimenez-Villarruel M. Risk factors for asthenopia among computer terminal operators. Salud Publica Mex 1996;38:189-96.
20. Nakazawa T, Okubo Y, Suwazono Y, Kobayashi E, Komine S, Kato N, *et al*. Association between duration of daily VDT use and subjective symptoms. Am J Ind Med 2002;42:421-6.
21. Logaraj M, Madhupriya V, Hegde S. Computer vision syndrome and associated factors among medical and engineering students in Chennai. Ann Med Health Sci Res 2014;4:179-85.
22. Dost S, Hossain A, Shehab M, Abdelwahed A, Al-Nusair L. Perceptions of medical students towards online teaching during the COVID-19 pandemic: A national cross-sectional survey of 2721 UK medical students. BMJ Open 2020;10:e042378.
23. Iqbal M, El-Massry A, Elagouz M, Elzembely H. Computer vision syndrome survey among the medical students in Sohag University Hospital, Egypt. Ophthalmol Res 2018;8:1-8.
24. Zhang Y, Deng G, Zhang Z, Zhou Q, Gao X, Di L, *et al*. A cross sectional study between the prevalence of chronic pain and academic pressure in adolescents in China (Shanghai). BMC Musculoskelet Disord 2015;16:219.
25. Lorusso A, Bruno S, L'Abbate N. Musculoskeletal disorders among university student computer users. Med Lav 2009;100:29-34.
26. Jaiswal S, Asper L, Long J, Lee A, Harrison K, Golebiowski B. Ocular and visual discomfort associated with smartphones, tablets and computers: What we do and do not know. Clin Exp Optom 2019;102:463-77.
27. Park JS, Choi MJ, Ma JE, Moon JHMoon HJ. Influence of cellular phone videos and games on dry eye syndrome in university students. J Korean Acad Nurs 2014;25:12-23.
28. Golebiowski B, Long J, Harrison K, Lee A, Asper L. Smartphone use and effects on tear film, blinking and binocular vision. Invest Ophthalmol Vis Sci 2018;59:913.
29. Sarkar TK, Taneja N, Jana PK, Gupta S, Dalal R, Dasgupta R, *et al*. Effect of mobile phone overuse on health of medical students. Int J Med Sci Public Health 2019;8:91-4.
30. Nowreen N, Ahad F. Effect of smartphone usage on quality of sleep in medical students. Natl J Physiol Pharm Pharmacol 2018;8:1366-70.
31. Bączek M, Zagańczyk-Bączek M, Szpringer M, Jaroszyński A, Wożakowska-Kapłon B. Students' perception of online learning during the COVID-19 pandemic. Medicine 2021;19:e24821.
32. Walker M, Peyton JW. Teaching in theatre. In: Rickmansworth JW, editor. Teaching and Learning in Medical Practice. UK: Manticore Europe Limited; 1998. p. 171-1.
33. Sharma D, Bhaskar S. Addressing the Covid-19 burden on medical education and training: The role of telemedicine and tele-education during and beyond the pandemic. Front Public Health 2020;8:589669.

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