Journal of Health Sciences

RESEARCH ARTICLE Open Access

Sedentary habits and physical health of secondary school students in online classes during the pandemic COVID-19

Nejra Ćibo[1]*, Hana Omerović[1,2], Amar Žilić[1], Zarema Obradović[3], Đemil Omerović[4], Edina Tanović[5]

[1]PhD student, Faculty of Health Studies, University of Sarajevo, Sarajevo, Bosnia and Herzegovina, [2]PZU Verdant Pharmacies, Sarajevo, Bosnia and Herzegovina, [3]Department for sanitary engineering, Faculty of Health Studies, University of Sarajevo, Sarajevo, Bosnia and Herzegovina, [4]Clinic for Orthopedics and Traumatology, Clinical center of Sarajevo University, Bosnia and Herzegovina, [5]Clinic for Physical Medicine and Rehabilitation, Clinical center of Sarajevo University, Sarajevo, Bosnia and Herzegovina

ABSTRACT

Introduction: Due to the declaration of a state of emergency in the country due to the pandemic COVID-19, the education system was changed to online teaching. The implementation of distance education has led to an increased sedentary lifestyle, decreased physical activity, and increased use of information technologies. The purpose of this study was to analyze the sedentary habits of female students and their physical health during a period of restricted physical activity with reference to online instruction.

Methods: The research was conducted among the first to third grade students of Secondary School Konjic, 45 days after the implementation of online instruction. Students of general secondary school (N = 83), business school (N = 68), and medical school (N = 55) completed the questionnaire after their parents gave their consent.

Results: The total number of students surveyed was 206, with students from all three schools studied participating in online classes for up to 4 hours. Medical school students spend more than 3 hours completing schoolwork, while students at the other two schools spend up to 2 hours. Statistically significant differences in non-use of information technology during free time exist among medical students ($p = 0.00$). Female medical students reported daily symptoms such as headaches, reactions to the visual organ (dry eye, redness, and tearing), and pain in the fist area (twitching, cramps, and tingling). Statistically significant differences in the occurrence of pain in the upper back and chest girdle occurred in students of business school ($p = 0.00$) and general high school ($p = 0.00$) compared to medical students.

Conclusion: Medical students who use information technology the most reported headaches, pain in the fist area, and frequent reactions to the sense of sight (dry eye, lacrimation, and redness). Assuming inappropriate positions during prolonged use of technology may contribute to poor posture.

Keywords: Online teaching; sedentary habits; school; COVID-19

INTRODUCTION

The 2019 coronavirus pandemic (COVID-19) has significantly affected daily life around the world. The usual rhythm of life and daily activities has changed. The lives of many children and adolescents are now increasingly influenced by new technological devices and communication tools (smartphones, tablets, and computers) (1). The World Health Organization declared COVID-19 a pandemic on March 11, 2020 (2). The emergence and spread of the COVID-19 pandemic had a severe impact on various work sectors, including the education system. More than 190 countries worldwide were forced to close schools, affecting at least 1.5 billion school-aged children (3). The declaration of a pandemic, social distancing, and the imposition of curfews have led to a change in habits across all age groups. These restrictions have led to the suggestion that longer term restrictive measures have negative effects on certain habits, which may also contribute to the deterioration of physical health (4). In mid-March 2020, the relevant ministry and the government of Herzegovina-Neretva Canton suspended classroom instruction and ordered the implementation of the educational process through distance learning, that is, transition to online instruction through appropriate platforms (e-school and Google Classroom) (5). In addition to the transition to online instruction, a restrictive measure of prohibiting physical activity for individuals under 18 years of age was introduced (6). In the past, children spent their free time outside the home doing lighter physical work, whereas girls engaged in domestic activities and were out and about significantly more. Physical activities were part of everyday life and did not represent anything difficult or hard, whereas today most children spend their free time at

*Corresponding author: Nejra Ćibo, Faculty of Health Studies, University of Sarajevo, Stjepana Tomića 1, 71000 Sarajevo, Bosnia and Herzegovina. E-mail: nejra.cibo@fzs.unsa.ba

Submitted: 18 January 2022/Accepted: 05 April 2022

DOI: https://doi.org/10.17532/jhsci.2022.1648

UNIVERSITY OF SARAJEVO
FACULTY OF HEALTH STUDIES

home and use technology, so the level of physical activity has generally decreased (7). Children are increasingly busy with tasks at school and do not have too much time for activities in their free time (8). Most students spend their free time in front of the TV, behind the computer or cell phone, and are not sufficiently familiar with the consequences of such a life (7). In the study conducted by Jurišić (2019), the relationship with physical activity has changed. A quarter of children are physically active. They spend most of their time sitting and the time spent in front of a screen is 2 hours/day (9). In a similar study by Bouillet et al. (2008), although respondents spend their free time going out, most still believe that free time, time spent lying down, and time spent sitting are ideal. Sports and athletic activities do not play a role in their idea of entertainment and they prefer less and less physical activities (10). With the advent of technology, life has become easier, so everyone is less tired and moves less every day. Sedentary lifestyle dominates, and our body suffers from these changes. Physical activity is one of the basic and even the most important human needs for functioning and maintaining health itself (11). The frequency of sedentary lifestyle and reduced physical activity lead to headaches. In addition to headache, irregular posture caused by frequent sitting at school or computer leads to the occurrence of kyphosis or scoliosis. In addition to kyphosis, there are also loss of strength, loss of muscle mass, and back pain (9). The radical changes in this case involved online teaching, where many students were forced to use information technologies to meet the needs of school obligations, whereas previously they had free choice. Therefore, the potential development of risk factors for health problems such as hypokinesia, obesity, cardiovascular disease, anxiety, and depression increased as a result of irregular physical activity and exercise (12), the occurrence of musculoskeletal disorders (metacarpal tunnel syndrome and a syndrome of computer vision) as a result of inappropriate sitting postures in front of screens and the use of information technologies (13).

In view of this, we aimed to use this study to analyze the sedentary habits of female university students and their physical health during the movement restriction caused by the pandemic COVID-19 in the context of online courses. The analysis of sedentary habits includes the time use of information technology for the purpose of learning and monitoring online classes, as well as the use of technology during leisure time and the occurrence of acute pain in the upper back, fists, and visual sense. Considering that secondary school students worldwide (7,9,14) are high users of information technology, I believe that students' physical activity habits changed during the pandemic period, which is a research hypothesis.

METHODS

This is a descriptive analytical, cross-sectional study approved by Ethical committee of University of Sarajevo - Faculty of Health studies. The school administration of Konjic High School agreed to conduct the study. Online instruction began on March 16, 2020, and the study was conducted 45 days later. After consent was obtained, classroom teachers informed parents of the intent to conduct the study. The study was conducted with students whose parents had given consent.

In collaboration with the professors of physical education and health, a questionnaire was created in the Google Forms application and posted electronically in the Google Classroom 45 days after the start of online instruction. Metric features were not reviewed for the aforementioned questionnaire. When reviewing the individual papers and to obtain information, the questions from the questionnaire were included in these papers. The first part of the questionnaire contained general demographic characteristics (gender, age, and school attended by students), while the second part contained 11 questions related to the subject of the study (the duration of the use of information technologies for the purpose of monitoring online classes, reading and writing, the use of information technologies in leisure time, then the assessment of the occurrence of daily symptoms such as headaches, reactions to the visual organ (stinging, dry eyes, itching, and tearing), pain in the fist and upper back and chest girdle, and the types of positions students assume when following online classes and fulfilling school obligations). The questionnaire contained answers to the yes/no questions offered, the selection of an answer when more than 1 answer was offered, and a pictorial representation of the position so that the perception of the position could be created during the sedation habits. Subjects completing the questionnaire could select only one of the answers offered. The questionnaire is anonymous and took 8–10 minutes to complete.

The sample of respondents for this study was female students from the first to third grade, aged 15–18, who reside in the municipality of Konjic and attend a general secondary school (N = 83), a business school (N = 68), or a medical school (N = 55). These schools were selected because female students make up the majority of the student body.

The inclusion criterion was female students of secondary school age (15–18 years) attending a general secondary school, a business school, and a medical school.

The exclusion criterion was any male student of Konjic high school who completed the questionnaire and a female student who completed the survey and whose parents did not give consent. According to the school administration, no information was provided that there were individuals among the students who had previously reported the pain that was the subject of the survey. Statistical analysis was performed using the SPSS v. 21 statistical program. For the purposes of this study, descriptive statistics (frequency and percentage) were calculated, while the difference between the theoretical and observed student response frequencies was tested by a Chi-square test. The statistically accepted significance used in this work is at a level of $p \leq 0.05$.

RESULTS

The study involved 206 first-through third-grade students attending general secondary school, business school, and medical school. The switch to online classes led to a decrease in physical activity and an increase in sedentary lifestyle (time spent during class, use of information technologies, and time spent in front of screens), ultimately leading to the occurrence of acute pain during online classes.

Analysis of the responses to the first question in Table 1, which refers to time spent in online classes, shows that

TABLE 1. Time spent in online classes

Time spent	School								
	Medical			General-education secondary school			Economic		
	Frequency (%)	χ^2	*p*	Frequency (%)	χ^2	*p*	Frequency (%)	χ^2	*p*
In online classes									
Up to 2 hours	10 (18.2)	51.527*	0.00	9 (10.8)	71.590*	0.00	19 (27.9)	41.676*	0.00
Up to 4 hours	43 (78.2)			64 (77.1)			46 (67.6)		
Up to 6 hours	2 (3.6)			10 (12)			3 (4.4)		
Using information technologies for fulfilling school obligations									
Up to 1 hours	6 (10.9)	11.109*	0.01	8 (9.6)	19.217*	0.00	11 (16.2)	14.588*	0.00
Up to 2 hours	17 (30.9)			34 (41)			29 (42.6)		
Up to 3 hours	10 (18.2)			26 (31.3)			19 (27.9)		
Over 3 hours	22 (40)			15 (18.1)			9 (13.2)		
Writing and reading									
Up to 1 hours	8 (14.5)	9.073*	0.03	12 (14.5)	19.313*	0.00	26 (38.2)	20.118*	0.00
Up to 2 hours	23 (41.8)			37 (44.6)			26 (38.2)		
Up to 3 hours	12 (21.8)			13 (15.7)			11 (16.2)		
Over 3 hours	12 (21.8)			21 (25.3)			5 (7.4)		
Using information technologies for the purpose of leisure									
Not using IT after school	13 (23.6)	17.273*	0.00	12 (14.5)	6.337	0.18	11 (16.2)	7.882	0.10
Up to 1 hours	5 (9.1)			12 (14.5)			6 (8.8)		
Up to 2 hours	22 (40)			23 (27.7)			15 (22.1)		
Up to 3 hours	6 (10.9)			15 (18.1)			17 (25)		
Over 3 hours	9 (16.4)			21 (25.3)			19 (27.9)		

* $P \leq 0.05$ χ^2: Chi square test, IT: Information technology

students from all three schools tested, medical school (78.2%), general education high school (77.1%), and business school (67.6), spend up to 4 hours in online classes. For the time spent up to 2 hours, the percentage of responses was highest among students from business school (27.9%), in contrast to students from general high school, where only 10.0% of students spent up to 2 hours. When testing the differences between the theoretical and observed frequencies at the 0.05 significance level, the Chi-square test showed that there were statistically significant differences in all the samples studied.

Business school students (42.6%) and general education high school students (41.0%) reported needing up to 2 hours to meet their school obligations, while medical school students (40%) reported needing more than 3 hours. The results of the Chi-square test show that there are statistically significant differences in all three schools (Table 1).

Students attending general secondary school (44.6%) and medical school (41.8%) reported spending up to 2 hours on writing and reading, while business students (38.2%) equally reported spending up to 1 and up to 2 hours (Table 1).

The use of information technologies in free time is shown in Table 1. The results show that the students of general secondary school (27.7%) and business school (40.0%) use them the most, up to 2 hours. The highest percentage in non-use of information technology has the students of medical school (23.6%). When testing the differences between the theoretical and observed frequencies at the 0.05 level of significance, the Chi-square test showed that they were statistically significant only in the medical school ($\chi^2 = 17.273$; $p = 0.00$).

A look at the percentage representation of the response to the question about daily headaches by school duties (Table 2) shows that medical students had the most frequent headaches (45.5%), while general education high school students and business students had significantly fewer headaches (24.1%:20.6%). Their highest percentage may be related to a longer period of time spent taking online courses. Chi-square test showed that there are statistically significant differences in all tested samples.

Table 2 shows that medical students (38.3%) and less frequently business and general education high school students (20.6%:19.3%) reported reactions in the visual organs due to participation in online courses. There are statistically significant differences in reported post-school visual organ reactions in all samples studied.

Students indicated that they have upper back and pectoral girdle problems. Among them, the majority are medical students (52.7%), then general education high school students (34.9%) and business students (29.4%). Chi-square test shows that there are statistically significant differences between business school students ($\chi^2 = 11.529$; $p = 0.00$) and general high school students ($\chi^2 = 7.530$; $p = 0.00$) (Table 2).

Everyday problems with the fist (pain in the fist, stinging, and cramps) are relatively common in medical students (34.5%) and significantly less common in general education high school students and business students. When differences between theoretical and observed response frequencies were examined, statistically significant differences were found in all three schools studied using the Chi-square test (Table 2).

Time spent using information technology to fulfill school obligations required a specific position. Taking irregular positions for a long period of time also resulted in certain health problems. Tables 3-5 show the three positions with the highest number of responses.

TABLE 2. Everyday problems due to the use of information technologies

Everyday problems due to the use of information technologies	School								
	Medical			General-education secondary school			Economic		
	Frequency (%)	χ^2	*p*	Frequency (%)	χ^2	*P*	Frequency (%)	χ^2	*p*
Headaches after completing school obligations for the needs of online classes									
Yes	25 (45.5)	0.455*	0.05	20 (24.1)	22.277*	0.00	14 (20.6)	23.529*	0.00
No	30 (54.5)			63 (75.9)			54 (79.4)		
Problems with eyes (dry eyes, redness, itching, burning and increased tearing, etc.) after school obligations for online classes									
Yes	21 (38.2)	3.073*	0.01	16 (19.3)	31.337*	0.00	14 (20.6)	23.529*	0.00
No	34 (61.8)			67 (80.7)			54 (79.4)		
Problems with the upper back and shoulders (muscle pain and stiffness) after school obligations for online classes									
Yes	29 (52.7)	0.164	0.07	29 (34.9)	7.530*	0.00	20 (29.4)	11.529*	0.00
No	26 (47.3)			54 (65.1)			48 (70.6)		
Hand problems (fist pain, stinging and cramping) due to daily use of mouse, cell phone and writing									
Yes	19 (34.5)	5.255*	0.00	17 (20.5)	28.928*	0.00	11 (16.2)	31.118*	0.00
No	36 (65.5)			66 (79.5)			57 (83.8)		

P≤0.05 χ^2: Chi square test

TABLE 3. The most common positions that students take when following online classes and fulfilling school obligations

School	Types of positions	Frequency (%)	χ^2	*p*
Economic	Lying position with hands down and bowed heads	20 (29.4)	42.382	0.00
	Sitting position with bowed head and irregular back position, back resting centrally on backrest	11 (16.2)		
	Sitting position with hands raised and back straight and leaning on a support	13 (19.1)		
General-education secondary school	Lying position with hands down and bowed heads	17 (20.5)	24.241	0.00
	Sitting position with arms raised and back straight and leaning on a support	17 (20.5)		
	Using IT in a supine position	11 (13.3)		
Medical	Sitting position with head down and irregular back position, back resting centrally on backrest	14 (25.5)	21.745	0.00
	Sitting position with hands raised and back straight and leaning on a support	8 (14.5)		
	Using IT in a supine position	9 (16.4)		

TABLE 4. The most common positions that students take when writing

School	Types of positions	Frequency (%)	χ^2	*p*
Economic	Sitting position with simultaneous leaning and leaning on both arms	18 (26.5)	21.559	0.00
	Sitting position with slightly bent of upper part and bent and raised legs from the floor	12 (17.6)		
	Proper sitting position when writing	16 (23.5)		
General-education secondary school	Sitting position with simultaneous leaning and leaning on both arms	29 (34.9)	46.627	0.00
	Sitting position with a slightly bowed head	13 (15.7)		
	Proper sitting position when writing	20 (24.1)		
Medical	Sitting position with simultaneous leaning and leaning on both arms	11 (20.0)	12.345	0.01
	Proper sitting position when writing	12 (21.8)		
	Sitting position while writing with slightly forward bent of upper body	9 (16.4)		

When observing online teaching and the fulfillment of school duties, business school students (29.4%) responded that they adopted a reclining position with hands and head lowered, while medical students (25.5%) adopted an irregular sitting position with head down and an irregular back position with the middle part of the back resting on the backrest. However, students in general education high schools answered the question in the same way, with the lowest use of information technology in a prone position compared to the other two schools (13.3%). When examining the differences between the theoretical and observed response frequencies, the Chi-square test found statistically significant differences in all subsamples examined (Table 3).

When analyzing the obtained results, it appears that the students of the business school (26.5%) and the general secondary school (34.9%) adopt an irregular sitting position, leaning on both hands at the same time, while the students of the medical school (21.8%) adopt a correct

TABLE 5. The most common positions that students take when reading

School	Types of positions	Frequency (%)	χ^2	*p*
Economic	Sitting position with head slightly bowed down	18 (26.5)	35.588	0.00
	Lying position on the belly with elbow support	22 (32.4)		
	Lying position with pronounced kyphotic posture of the spine	18 (26.5)		
General-education secondary school	Sitting position with head slightly bowed down	22 (26.5)	40.542	0.00
	Lying position on the belly with elbow support	22 (26.5)		
	Lying position with pronounced kyphotic posture of the spine	26 (31.3)		
Medical	Sitting position with head slightly bowed down	11 (20.0)	22.345	0.00
	Lying position on the belly with elbow support	17 (30.9)		
	Lying position with pronounced kyphotic posture of the spine	16 (29.1)		

sitting position when writing. Based on the results of the Chi-square test, it was found that there were statistically significant differences in all samples tested (Table 4).

The improper lying position on the stomach with support on the elbows was most frequently adopted by students of business school (32.4%) and medical school (30.9%), while students of general secondary school gave the same number of answers to the question asked. When lying down and in an irregular position with a pronounced kyphotic spinal posture, the highest percentage of responses was given by students of general education high schools (31.3%). Based on the results of the Chi-square test, it was found that there were statistically significant differences in all the samples studied (Table 5).

DISCUSSION

The purpose of this study was to investigate the sedentary habits and physical health of university students during online classes in the pandemic COVID-19. The results show changes in sedentary behaviors, decreased physical activity, and increased use of information technology, both for school and leisure purposes. With the introduction of the state of emergency in our country, regular classes were stopped and, as a result, the educational process began to be conducted online. The change in the way the educational process was conducted resulted in students being forced to sit for long periods of time and spend time in front of screens. The use of information technology increases with age, so increased use of computers and cell phones in continuing education is expected (13).

Students and teachers have been forced to teach through the online platform, and thus, the sedentary lifestyle is increasing. In an effort to minimize the negative effects of sitting at the computer for long periods of time, classes were held for a maximum of 4 hours.

When asked how much time students spend with online instruction, students at all three schools indicated that they follow online instruction for up to 4 hours; more specifically, they follow the entire instructional process. The duration of instruction of up to 4 hours meant a longer stay in front of the screen. Excessive online learning and lectures were addressed by Amit (2021) who obtained the information that all children participated in online lessons on a mobile device for more than 4 hours (14). During the COVID-19 pandemic, the use of technology, especially cell phones, became inevitable in all populations. A study of schoolchildren in China found that mobile device use increased by 3.9 hours (15). A similar study to monitor online teaching and delivery of classroom activities was conducted in Indonesia on 145 students, with 50% of respondents indicating that they used a laptop as one of the feasible technologies (16). Despite spending so much time on computers, in all samples studied, about 15% of students in general education high schools and business schools did not use information technology in their free time, or about 24% in medical school.

Given the amount of time medical students spend on the computer to fulfill their school obligations, it is understandable why this percentage is higher compared to the other two schools. It is important to emphasize that while conducting the research to prevent the spread of the COVID-19 virus, the relevant institutions prohibited the movement of individuals under the age of 18, which in a sense forced students to use technology in their free time, which is another reason for the specificity of the work itself and the conditions under which the research was conducted. Despite the special conditions, leisure time spent in front of screens was studied. For example, in America, it was found that adolescents spend an average of about 7.5 hours using various information technologies (17). Even before the pandemic, students spent a lot of time using information technology. A study conducted in Canada found that hours spent in sedentary activities increased by 3 hours (18). Also specific to the Canadian population, lower levels of physical activity and increased sedentary behavior were found in a sample of children aged 5–17 years (19). A study conducted in the American Southwest showed a sharp increase in sedentary behavior from 4 hours/day to as much as 7 hours/day during the pandemic COVID-19 (20).

The use of computers, cell phones, or tablets leads to the occurrence of headaches (9). The use of these devices is associated with the occurrence of headaches and various musculoskeletal problems in female students. The long time spent in front of screens is certainly not without consequences: One in two medical students reports daily headaches. The symptom most frequently mentioned by respondents in the work of the author Amith (2021) was headache, even 53.9% (14). When examining the occurrence of headaches due to prolonged use of information technologies, it was found that adolescents who spend a lot of time in front of screens have a higher risk of getting headaches, especially

among respondents who use video games. The results also suggest that it is possible to associate the occurrence of headaches with prolonged time in front of screens of various types (21).

Then, reactions to the sense of sight (dry eye, redness, and burning) are an indispensable part of everyday problems resulting from long-term use of technology. Excessive time spent in front of screens and being indoors, which includes other aspects of the indoor environment such as low humidity or dry air, can also be associated with an exacerbation of dry eye. The most common responses to vision (38.3%) were reported by medical students, while general education high school students and business students had a higher percentage of negative responses. Negative visual effects resulting from screen time have led to a definition and expert term summarizing the symptoms associated with visual reactions to screen use (22).

Review of adolescents' vision responses to prolonged exposure to computers revealed symptoms indicative of computer vision syndrome, with the symptom of tired eyes being the most common (81%) and the sensation of dry eyes (7.8%) (23). The study, which focused on eye strain and dry eye symptoms, included subjects with mild (25%), moderate (21%), and severe (54%) dry eyes. During the pandemic, time spent in front of screens and reading doubled, mild (39%), moderate (51%), and severe (38%) dry eye, and respondents reported eye pain and headaches due to eye symptoms (24).

Musculoskeletal problems include the occurrence of pain in the neck, back, and chest girdle. The occurrence of pain symptoms in the neck and pectoral girdle is most prevalent among medical students, while one in two students affirmed the occurrence of daily pain. In conjunction with time spent in online courses, performing school duties, and leisure time, we can conclude that the occurrence of pain is more pronounced when sitting in irregular positions for long periods of time. Some authors believe that the occurrence of upper back pain is related to the increase in time spent in front of screens (25,26) and that there has been a percentage increase in pain compared to similar studies conducted eleven years ago (25). A study conducted in Palestine also shows that as the use of information technology increases, so does pain. Neck pain was reported by 32.2% of the respondents, 15.3% had right shoulder pain, 20% had left shoulder pain, and 15.1% had back pain (27).

Due to prolonged writing, mouse, and cell phone use, female students reported the occurrence of pain in the fist. The occurrence of pain in the fist area is the most frequently reported case among medical students (52.7%). The pain occurred more frequently due to the long time that students spend fulfilling their school obligations, which can lead to greater pressure on the median nerve due to the longer time, which can lead to the formation of metacarpal tunnel syndrome. The occurrence of pain symptoms in the fist region is more common in the working population who spend the entire workday at the computer, which may lead to the occurrence of metacarpal tunnel syndrome due to increased pressure in the metacarpal tunnel as well as repetitive fist movements and awkward posture (28).

To fulfill school duties, students take appropriate positions. A study conducted in Palestine showed that there is a correlation between the use of computers, cell phones, or tablets and the occurrence of pain in the neck. In addition, increased pain can slow down normal activities such as walking, bending, and standing up (27). The most common posture adopted by students at all three schools while performing their academic duties (20%) was a position with hands down and head lowered. In reading, the students of the business school (26.5%) and the students of the general secondary school (34.9%) adopted a sitting position, leaning on both hands at the same time, while 21% of the students of the medical school adopted the right position. When writing, the highest percentage of students from all three schools reported adopting an irregular position on the stomach with support from the elbows. In their work, the study mentioned above analyzed the positions while using information technologies. The results show that 49.9% of the respondents sit on a chair and lean forward. However, 17.1% of the respondents indicated that they usually sit on a chair with a flat spine, and 14.3% of the respondents indicated that they usually sit in a reclining position. In addition, 12.7% of the respondents reported that they sit on the floor with their back leaning forward (27). Considering the positions of our students and respondents in the aforementioned study, we can conclude that inadequate posture causes acute pain to occur and the musculoskeletal system to be stressed only after a longer period of time.

Limitation of the Study

The main limitations lie in the fact that it is difficult to conduct a sample under the conditions of restricted movement or some kind of total prohibition, since classes are exclusively online and all school obligations are solved online.

CONCLUSION

The results undoubtedly indicate a greater use of information technology during the pandemic COVID-19, which is related to distance education and social distancing measures taken while conducting the research. In all three schools studied, students participated in online classes for up to 4 hours. Altered behaviors related to sedentary behavior, reduced physical activity, and increased use of technology significantly dominate among female medical students. Medical students spend their free time without using information technologies. This justifies their greater use of technology during class, their engagement in learning and fulfilling school responsibilities, and a high-grade point average in mid-year grades. For all these reasons, they want to devote their free time to other activities. Medical students most frequently reported pain in the neck, chest girdle, and fist. A significant increase in poor posture was observed when using technology and performing school duties. Taking online courses in emergency situations result in a negative outcome. Since COVID-19 was found to leave no serious consequences for adolescents, restrictive measures will lead us to be more concerned with the negative consequences of online instruction on student health than the pandemic did. Normalizing conditions and transitioning to classroom learning will lead to a reduction in negative impacts on student health.

DECLARATION OF INTERESTS

Authors declare no conflict of interest.

REFERENCES

1. Dinleyici M, Carman K, Ozturk E, Sahin-Dagli F. Media use by children, and parents' views on children's media usage interact. J Med Res 2016;5(2):e18.
   https://doi.org/10.2196/ijmr.5668
2. UNESCO. UNESCO COVID-19 Education Response: How Many Students Are at Risk of Not Returning to School? Advocacy Paper-Unesco BiblioTeca Digital. Available from: https://unesdoc.unesco.org/ark:/48223/pf0000373992 [Last accessed on 2022 Feb 14].
3. UNESCO. How many Students are at Risk of not Returning to School? UNESCO COVID-19 Education Response, Advocacy Paper. Available from: https://unesdoc.unesco.org/ark:/48223/pf0000373992.locale=en [Last accessed on 2020 Jul 30].
4. Bates LC, Zieff G, Stanford K, Moore JB, Kerr ZY, Hanson ED, et al. COVID-19 Impact on behaviors across the 24-hour day in children and adolescents: Physical Activity, sedentary behavior and sleep. Children 2020;7:138.
5. Ministarstvo Obrazovanja Nauke, Kulture i Sporta. Ministarstvo HNK Najavilo Online Platformu za Izvođenje Nastave u HNK. Available from: https://monkshnk.gov.ba/Obavijest/Pregled/13015 [Last accessed on 2022 Feb 19].
6. Federalna Uprava Civilne Zaštite. Available from: http://www.fucz.gov.ba/na-danasnjoj-cetvrtoj-vanrednoj-sjednici-federalnog-staba-civilne-zastite-usvojene-nove-naredbe-preporuke-i-odluke [Last accessed on 2022 Feb 19].
7. Lisjak T. Razina Tjelesne Aktivnosti i Korištenje Moderne Tehnologije Kod Učenika u Primarnom Obrazovanju [Diplomski rad]. Pula: Sveučilište Jurja Dobrile u Puli; 2021. Available from: https://urn.nsk.hr/urn: nbn:hr:137:286046 [Last accessed on 2022 Feb 16].
8. Lewthwaite H, Effing TW, Lenferink A, Olds T, Williams MT. Improving physical activity, sedentary behaviour and sleep in COPD: perspectives of people with COPD and experts via a Delphi approach. PeerJ 2018;6:e4604.
   https://doi.org/10.7717/peerj.4604
9. Jurišić I, Puharić Z, Šimetin IP, Dikanović M, Cvitković A. Sedentary lifestyle and headaches in schoolchildren. Paediatr Croatica. 2019;63(2):62-62.
   https://doi.org/10.13112/PC.2019.9
10. Bouillet D, Ilišin V, Potočnik D. Continuity and changes in Croatian university students' leisure time activities. Soc Prostor. 2008;46(180):123-42.
11. Sygit KM, Sygit M, Wojtyła-Buciora P, Lubiniec O, Stelmach W, Krakowiak J. Physical activity as an important element in organizing and managing the lifestyle of populations in urban and rural environments. Ann Agric Environ Med. 2019;26(1):8-12.
12. American Optometric Association. Computer Vision Syndrome. Available from: https://www.aoa.org/healthy-eyes/eye-and-vision-conditions/computer-vision-syndrome?sso=y [Last accessed on 2021 Oct 08].
13. Kraemer Marktforschung GMBH. Kinder Medien Studien 2019-Sudie (online Verlag). Hamburg: Springer VS; 2019.
14. Mohan A, Sen P, Mujumdar D, Shah C, Jain E. Series of cases of acute acquired comitant esotropia in children associated with excessive online classes on smartphone during COVID-19 pandemic; digital eye strain among kids (DESK) study-3. Strabismus 2021;29(3):163-7.
   https://doi.org/10.1080/09273972.2021.1948072
15. Guan H, Yu NN, Wang H, Boswell M, Shi Y, Rozelle S, et al. Impact of various types of near work and time spent outdoors at different times of day on visual acuity and refractive error among Chinese school-going children. PLoS One 2019;14(4):e0215827.
   https://doi.org/10.1371/journal.pone.0215827
16. Ubaedillah U, Damar IP. Utilization of information technology during the covid-19 pandemic: Student's perception of online lectures. Edukatif 2021;3(2):320.
   https://doi.org/10.31004/edukatif.v3i2.320
17. Carson V, Staiano AE, Katzmarzyk PT. Physical activity, screen time, and sitting among U.S. adolescents. Pediatr Exerc Sci 2015;27(1):151-9.
   https://doi.org/10.1123/pes.2014-0022
18. Bertrand L, Shaw KA, Ko J, Deprez D, Chilibeck PD, Zello GA. The impact of the coronavirus disease 2019 (COVID-19) pandemic on university students' dietary intake, physical activity, and sedentary behaviour. Appl Physiol Nutr Metab. 2021;46(3):265-72.
   https://doi.org/10.1139/apnm-2020-0990
19. Moore SA, Faulkner G, Rhodes RE, Brussoni M, Chulak-Bozzer T, Ferguson LJ, et al. Impact of the COVID-19 virus outbreak on movement and play behaviours of Canadian children and youth: A national survey. Int J Behav Nutr Phys Act 2020;17(1):85.
   https://doi.org/10.1186/s12966-020-00987-8
20. Sidebottom C, Ullevig S, Cheever K, Zhang T. Effects of COVID-19 pandemic and quarantine period on physical activity and dietary habits of college-aged students. Sports Med Health Sci 2021;3(4):228-235.
   https://doi.org/10.1016/j.smhs.2021.08.005
21. Xavier MK, Pitangui AC, Silva GR, Oliveira VM, Beltrão NB, Araújo RC. Prevalence of headache in adolescents and association with use of computer and videogames. Cien Saude Colet 2015;20(11):3477-86.
   https://doi.org/10.1590/1413-812320152011.19272014
22. Nelson MC, Neumark-Stzainer D, Hannan PJ, Sirard JR, Story M. Longitudinal and secular trends in physical activity and sedentary behavior during adolescence. Pediatrics 2006;118(6):e1627-34.
   https://doi.org/10.1542/peds.2006-0926
23. Khalaj M, Ebrahimi M, Shojai P, Bagherzadeh R, Sadeghi T, Mehran G. Computer vision syndrome in eleven to eighteen-year-old students in Qazvin. Biotech Health Sci. 2015;2(3):e28234.
   https://dx.doi.org/10.17795/bhs-28234
24. Saldanha IJ, Petris R, Makara M, Channa P, Akpek EK. Impact of the COVID-19 pandemic on eye strain and dry eye symptoms. Ocul Surf 2021;22:38-46.
   https://doi.org/10.1016/j.jtos.2021.06.004
25. Hakala P, Rimpelä A, Salminen JJ, Virtanen SM, Rimpelä M. Back, neck, and shoulder pain in Finnish adolescents: National cross sectional surveys. BMJ 2002;325(7367):743.
   https://doi.org/10.1136/bmj.325.7367.743
26. Wei X, Zang Y, Jia X, He X, Zou S, Wang H. et al. Age, period and cohort effects and the predictors of physical activity and sedentary behaviour among Chinese children, from 2004 to 2011. BMC Public Health. 2017;17(1):353.
   https://doi.org/10.1186/s12889-017-4215-x
27. Yaseen QB, Salah H. The impact of e-learning during COVID-19 pandemic on students' body aches in Palestine. Sci Rep 2021;11(1):22379.
   https://doi.org/10.1038/s41598-021-01967-z
28. Goldschmidt K. The COVID-19 pandemic: Technology use to support the wellbeing of children. J Pediatr Nurs. 2020;53:88-90.
   https://doi.org/10.1016/j.pedn.2020.04.013