Musculoskeletal System Pain and Related Factors During Online Education in the COVID-19 Pandemic among Ankara University Faculty of Medicine Students, Turkey

COVID-19 Pandemisinde Uzaktan Eğitim Alan Ankara Üniversitesi Tıp Fakültesi Öğrencilerinde, Kas-İskelet Sistemi Ağrısı ve İlişkili Faktörler

Seçilay Güneş[1], Bahar Halenur Ulusoy[2], Elif Aygen[2], Emirhan Murat[2], Beyza Köklüoğlu[2], Buse Arzum Kuzyaka[2], Şevval Aydın[2], Müjgan Necioğlu[2], İrem Kar[3], Şehim Kutlay[1]

[1]Ankara University Faculty of Medicine, Department of Physical Medicine and Rehabilitation, Ankara, Turkey
[2]Ankara University Faculty of Medicine 4th Year Student, Ankara, Turkey
[3]Ankara University Faculty of Medicine, Department of Biostatistics, Ankara, Turkey

Abstract

Objectives: This study aims to determine the prevalence of musculoskeletal pain (MSP) and its related factors among Ankara University Faculty of Medicine students during online education in the coronavirus disease-2019 (COVID-19) pandemic and to investigate the effects of the MSP on students' quality of life.

Materials and Methods: This cross-sectional study was conducted among medical students who responded online questionnaire between April and July 2021. The frequency of MSP (Nordic Musculoskeletal Questionnaire), level of physical activity (International Physical Activity Questionnaire-Short Form), and depressive symptoms [Beck Depression Inventory (BDI)], and the health status [Short Form-36 Health Survey Questionnaire (SF-36)] of the students were evaluated.

Results: A total of 233 students (65.7% female) with a mean age of 20.1±1.5 years responded to our survey. By individual body side, the most commonly affected body regions within one year were upper back (79.4%), neck (71.7%), lower back (69.5%), and shoulders (60.1%), respectively. Twelve-month MSP prevalence was higher in female students at the neck (p=0.01) and upper back (p=0.001). Body mass index, smoking, and time spent on technology-based devices were not related to MSP prevalence. Physical activity level was significantly lower in those with upper back and low back pain. BDI scores were found to be significantly higher in those with neck, upper back, lower back, and shoulder pain in the 7-day-period, compared to those without. The SF-36 scores of those with MSP was found to be significantly lower than those without.

Conclusion: The prevalence of MSP was very high among medical students receiving online education during the COVID-19 pandemic. Depressive symptoms were more pronounced in students with MSP and it was evident that the MSP affected the quality of life negatively. Preventive measures should be considered to reduce MSP in this population.

Key Words: Musculoskeletal Pain, Physical Activity, Depression, Medical Students, Online Education, Quality of Life, COVID-19

Öz

Amaç: Bu çalışma, koronavirüs hastalığı-2019 (COVID-19) pandemisi sürecinde online eğitim alan Ankara Üniversitesi Tıp Fakültesi öğrencilerinde kas-iskelet sistemi ağrı prevalansını, ağrı ile ilişkili faktörleri belirlemeyi ve kas-iskelet sistemi ağrılarının öğrencilerin yaşam kalitesi üzerindeki etkilerini değerlendirmeyi amaçlamaktadır.

Gereç ve Yöntem: Kesitsel olarak yürütülen bu çalışma, Nisan-Temmuz 2021 tarihleri arasında çevrimiçi olarak uygulanan anketi yanıtlayan tıp öğrencileri arasında yapıldı. Kas-iskelet sistemi ağrısı, Nordic Kas İskelet Sistemi anketiyle, fiziksel aktivite düzeyi Uluslararası Fiziksel Aktivite Anketi-Kısa Form ile, depresif belirtiler Beck Depresyon Envanteri (BDI) ile, yaşam kaliteleri Kısa Form-36 Sağlık Anketi Anketi (SF-36) ile değerlendirildi.

Bulgular: Araştırma anketimize yaş ortalamaları 20,1±1,5 yıl olan toplam 233 öğrenci (%65,7 kadın) yanıt verdi. Son bir yıl içinde en sık ağrı görülen vücut bölgeleri sırt (%79,4), boyun (%71,7), bel (%69,5) ve omuzlardı (%60,1). Son bir yıl içinde görülen boyun (p=0,01) ve sırt (p=0,001) ağrısı kadınlarda anlamlı derecede yüksekti. Vücut kitle indeksi, sigara kullanımı ve teknolojik cihazlarda geçirilen süre kas-iskelet sistemi ağrısı ile ilişkili değildi. Sırt ve bel ağrısı olanlarda fiziksel aktivite düzeyi anlamlı olarak daha düşüktü. Son 7 günde boyun, sırt, bel ve omuz ağrısı olanlarda BDI puanları olmayanlara göre anlamlı olarak daha yüksek bulundu. Kas-iskelet sisteminde ağrısı olanların SF-36 puanları olmayanlara göre anlamlı derecede düşük bulundu.

Sonuç: COVID-19 pandemisi sürecinde çevrimiçi eğitim alan tıp öğrencileri arasında kas-iskelet sisteminde ağrı prevalansı çok yüksekti. Ağrısı olan öğrencilerde depresif belirtiler daha belirgindi ve ağrının yaşam kalitesini olumsuz etkilediği görüldü. Bu popülasyonda kas-iskelet sistemi ağrısını azaltmak için önleyici tedbirler dikkate alınmalıdır.

Anahtar Kelimeler: Kas İskelet Sistemi Ağrısı, Fiziksel Aktivite, Depresyon, Tıp Öğrencileri, Uzaktan Eğitim, Yaşam Kalitesi, COVID-19

Introduction

The coronavirus disease-2019 (COVID-19), which emerged in Wuhan, China in December 2019, was declared as a pandemic by the World Health Organization on March 11, 2020. The governments began to take various quarantine preventions in order to slow the spread of the virus. Among the preventive measures taken in Turkey, along with the curfews, education on online platforms was at the forefront. In March 2020, face-to-face education was suspended and online education has become an important part of the lives of all students, including university. This major change in the learning environment brought about a significant increase in the time that students spent with technological devices in various forms such as laptops, computers, mobile phones, or tablets. The uncertainty in the education system, whether each student has his/her own study room or computer, and the conditions of the home environment during online education increased anxiety and depressive symptoms (1). In addition to all these, curfews also caused students to remain inactive.

It is known that certain positions like prolonged standing or sitting (2), long hours of computer use (3), lack of physical activity (4), and depression (5) are triggers for musculoskeletal pain (MSP). In studies evaluating MSP among medical school students before the pandemic has reported that at least 65.1% of medical students complained of pain in at least one body region within a year (6). To the best of our knowledge, there is no study evaluating MSP and related factors during online education among medical students. The primary aim of this study is to determine the prevalence of MSP and to explore associated factors among Ankara University Faculty of Medicine students during online education in the COVID-19 pandemic.

The secondary aim is to determine the impact of MSP on the students' quality of life.

Materials and Methods

This cross-sectional study was conducted between April-July 2021 in line with the principles of the Declaration of Helsinki. It was approved by the Ankara University Faculty of Medicine Students Ethics Committee (date: 25/03/2021, number: 79366). It was carried out as a web-based assessment via an online form. Ankara University Faculty of Medicine students aged 18 and over who volunteered to participate were involved in the study. Those with a history of musculoskeletal operation, a disease affecting the musculoskeletal system, with a diagnosis of depressive disorder, and who were 6th year of medical school were excluded.

Demographic and clinical characteristics of participants such as age, sex, body mass index (BMI), residence status before and after the pandemic, time spent on technology-based activities for education, was recorded.

Alterations of MSP among students were assessed with the standardized Turkish version of the Nordic Musculoskeletal Questionnaire (NMQ) (7). The NMQ is designed to assess the presence of musculoskeletal alterations covering nine different parts of the body: neck, shoulders, upper back, elbows, wrists/hands, lower back, hips/thighs, knees, and ankles/feet. All items are dichotomous and answered as "yes/no".

Physical activity was evaluated using the Turkish version of the International Physical Activity Questionnaire-Short Form (IPAQ-SF), which contains 7 questions (8). The questionnaire referred to the last 7 days and asked about walking, moderate-intensity activities, vigorous-intensity activities, and sitting time.

Güneş et al. Musculoskeleletal System Pain During Online Education in the Pandemic

Ankara Üniversitesi Tıp Fakültesi Mecmuası 2022;75(1):36-41

Physical activity was estimated by multiplying the metabolic equivalent (MET) score of each activity by the total amount of minutes spent per week. It was reported as a continuous measure and expressed as MET minutes per week (MET-min/week). Classified as physically inactive (<600 MET-min/week), low physical activity level (600-3000 MET-min/week), and adequate physical activity level (>3000 MET-min/week).

The rates of self-reported depression were assessed using the Beck Depression Inventory (BDI) (9). This questionnaire consists of 21 items, and each assesses a symptom related to depression during the past 2 weeks. Each item is scored on a 4-point scale from 0 to 3, with higher scores indicating severe symptoms. The total score is the sum of scores of all items and is calculated from 63 (10). A total score of 0 to 9 indicates minimum, 10 to 16 mild, 17 to 29 moderate, and 30 to 63 severe depression.

The health status of the students was evaluated with the Short Form-36 Health Survey Questionnaire (SF-36) consisting of eight scales: physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional, and mental health (10,11). Higher scores were related to good health status.

Statistical Analysis

Data were summarized as the mean ± standard deviation and median (minimum-maximum) for continuous variables and frequencies (percentiles) for the categorical variables. The Student's t-test or Mann-Whitney U test was used for two group comparisons, depending on the distributional properties of the data. Categorical variables were compared using the chi-square or Fisher's exact test as appropriate. The data was analyzed using the SPSS 11.5 for Windows (SPSS Inc., Chicago, IL, USA).

Results

A total of 233 students with an average age of 20.1±1.5 years responded to our survey. There were 153 (65.7%) females and most of the participants were year 2 students. Seventy-four percent of the participants stated that they attended more than half of the online training. The time spent on technology-based devices was found to be 3.8±2.3 hours. The participants rate the comfort level of the environment in which they participated in online education 5.7±2.07 out of 10 and 49% of them stated that they preferred face-to-face education. 83% of students had severe depression according to BDI and 41% of them were physically inactive (Table 1).

By individual body side, the most commonly affected body regions within one year were upper back (79,4%), neck (71.7%), lower back (69.5%), and shoulders (60.1%) respectively. The 7-day period prevalence was also similar (Table 2). Statistically significant differences in 12-month MSP prevalence were noted in female students at the neck (p=0.01) and upper back

Table 1: Demographic characteristics of medical students (n=233)	
Age (y)	20.1±1.5 20 (18-27)
Sex n (%)	
Female	153 (65.7)
BMI (kg/m²)	22.1±3.6 21.6 (16.1-45.7)
Year of study n (%)	
1st 2nd 3rd 4th 5th	65 (27.9) 68 (29.3) 49 (21.2) 34 (14.7) 16 (6.9)
State of being COVID n (%)	
Yes	35 (15.0)
Smoking n (%)	18 (7.7)
Weight-before pandemic	64.5±14.9 62 (40-140)
Weight-during pandemic	64.3±14.1 62 (39-139)
Residence status before pandemic n (%)	
Dorm Home-with family Home-with relatives Home-with friends Home-alone	76 (32.6) 127 (54.5) 3 (1.3) 18 (7.7) 9 (3.9)
Residence status after pandemic n (%)	
Dorm Home-with family Home-with relatives Home-with friends Home-alone	2 (0.9) 220 (94.4) 6 (2.6) 5 (2.1) 0 (0)
Education choice n (%)	
Face to face Online Mixed	106 (45.5) 36 (15.4) 91 (39.1)
Participation to online education n (%)	
0-49% 50-100%	60 (25.7) 173 (74.3)
Amount of online work per day (h)	3.8±2.3 4 (0-12)
Amount of non-online work per day (h)	1.9±1.7 2 (0-10)
The self-rate of the comfort level of the place attending online training	5.7±2.07 6 (0-10)
IPAQ-SF	
Active Low physical activity Inactive	57 (24.5) 79 (33.9) 97 (41.6)
BDI scores	
Minimum (0-13) Mild Moderate Severe	0 0 39 (16.8) 194 (83.2)

Data was expressed as mean ± standard deviation, median (min-max)
BDI: Beck Depression Inventory, IPAQ-SF: International Physical Activity Questionnaire-Short Form, COVID: Coronavirus disease

(p=0.001). BMI, smoking, and time spent on technology-based devices were not related to MSP prevalence.

BDI scores were found to be significantly higher in those with neck, upper back, lower back, and shoulder pain in the 7-day-period, compared to those without (Table 3). While physical activity levels were similar in those with and without neck, and shoulder pain, physical activity level was significantly lower in those with upper back and low back pain (p=0.043 and p=0.006 respectively). The SF-36 scores of those with MSP were found to be significantly lower than those without (Table 3).

Discussion

Our study showed that the MSP prevalence was common in the upper back, neck, lower back, and shoulder among Ankara University Medical School students who received online education. While female gender and higher BDI scores were related to MSP prevalence, smoking, BMI, and time spent on technology-based devices were not related. Physical activity level was found to be associated only with lower back and upper back pain. It was found that the quality of life in students with MSP was more negatively affected.

There are different studies evaluating the prevalence of MSP among medical students in different countries. The prevalence of MSP among Australian medical students was high, most commonly involve the neck (52.8%) followed by the lower back (51.6%) and shoulders (46.5%) (12). Among Malaysian medical students, lower back pain was most common, with a 7-day and 12-month prevalence of 27.2% and 46.1%, respectively (6). In Chinese medical students, the 12-month MSP prevalence was

Table 2: Prevalence of musculoskeletal pain within last 12 months and last 7 days (n=233)

Area of body affected	Pain within last 12 months n (%)	Pain preventing daily activities n (%)	Pain within last 7 days n (%)
Upper back	185 (79.4)	62 (26.6)	124 (53.2)
Neck	167 (71.7)	53 (22.7)	118 (50.6)
Lower back	162 (69.5)	71 (30.5)	111 (47.6)
Shoulder	140 (60.1)	29 (12.4)	80 (34.3)
Wrist hand	100 (42.9)	17 (7.3)	35 (15.0)
Hip/Thigh	92 (39.5)	17 (7.3)	38 (16.3)
Knee	88 (37.8)	22(9.4)	38 (16.3)
Ankles/feet	50 (21.5)	12 (5.2)	18 (7.7)
Elbow	41 (17.6)	5 (2.1)	14 (5.0)

Table 3: Comparison of SF-36, BDI and IPAQ-SF scores in patients with and without neck, upper back, lower back and shoulder pain

MSP region	Physical functioning	Role physical	Bodily pain	General health	Vitality	Social functioning	Role emotional	Mental health	IPAQ-SF	BDI
Neck										
Yes	89.2±12.1	59.1±39.8	57.2±21.0	57.7±21.0	36.1±19.5	64.3±24.7	23.1±37.6	50.8±18.6	1244.7±1467.8	37.5±8.4
No	92.5±9.4	67.1±39.2	74.5±20.1	74.5±20.1	43.7±19.0	72.2±23.6	33.0±41.2	57.1±17.1	1193.7±1572.4	33.3±6.5
p-value	0.049	0.143	<0.001	0.005	0.003	0.012	0.054	0.016	0.851	<0.001
Upper back										
Yes	89.7±11.7	58.8±40.3	59.5±21.8	58.2±21.4	36.4±18.4	65.3±25.0	22.5±36.9	51.4±19.1	1126.1±1179.6	36.7±8.2
No	92.1±10.0	67.78±38.5	72.9±20.7	65.0±18.6	43.7±20.3	71.5±23.5	34.2±41.9	56.7±16.7	1323.3±1825.0	34.0±7.1
p-value	0.090	0.076	<0.001	0.029	0.006	0.068	0.021	0.040	0.043	0.015
Lower back										
Yes	88.8±12.4	54.7±38.3	60.8±20.7	57.6±19.8	35.4±17.6	64.6±24.4	23.7±38.7	50.1±19.1	1067.8±1205.1	37.0±8.1
No	92.7±9.1	70.6±39.4	77.1±21.7	64.8±20.2	43.9±20.5	71.5±24.2	31.9±40.2	57.3±16.6	1358.8±1752.1	34.0±7.2
p-value	0.009	0.001	<0.001	0.006	0.001	0.023	0.053	0.006	0.006	0.006
Shoulder										
Yes	87.9±12.3	54.6±37.7	55.9±22.3	57.9±21.1	36.7±19.5	62.9±24.9	28.7±40.9	51.1±21.0	1376.8±1795.7	36.7±8.1
No	92.4±9.9	67.4±40.0	70.9±20.6	63.2±19.6	41.5±19.5	70.9±23.8	27.6±39.1	55.4±16.3	1138.1±1353.3	33.4±6.9
p-value	0.002	0.011	<0.001	0.089	0.138	0.019	0.962	0.21	0.212	0.003

Data was expressed as mean ± standard deviation
SF-36: Short Form-36 Health Survey Questionnaire, BDI: Beck Depression Inventory, IPAQ-SF: International Physical Activity Questionnaire-Short Form, MSP: Musculoskeletal pain

Güneş et al. Musculoskeleletal System Pain During Online Education in the Pandemic

Ankara Üniversitesi Tıp Fakültesi Mecmuası 2022;75(1):36-41

found 40.1% in the lower back, followed by the neck and shoulders 33.8%, 21.7% respectively (13). While the prevalence of MSP may differ depending on the selection of different student samples (pre-clinical, clinical, or both), the prevalence of pain in all body regions was found to be higher than the literature in our study. Considering that physical inactivity and depression levels, which are factors contributing to the development of MSP, increase during the pandemic period, this may be attributed to the higher prevalence of depressed and sedentary students in the study population. Also, we detected the highest prevalence of MSP in the upper back and neck. To the best of our knowledge, there is no study evaluating the prevalence of MSP and related factors in distance education in medical students during the COVID-19 pandemic. It is known that computer use increased in this period compared to face-to-face education. Therefore, our results are not surprising considering that neck pain is the most common in computer users, followed by upper back, and shoulder pain (3,14). However, contrary to our expectations, we did not find a relationship between the time spent on technology-based devices and the prevalence of MSP. There are some studies in the literature that are consistent with our results (15,16) in which Rajagopal et al. (15) stated higher MSP prevalence in female than male students but they could not found any correlation with the prevalence of MSP and the hours of computer use per day among Malaysian college students. The authors stated that this may be due to the smaller sample size. In our study, there are possible explanations. Firstly, although 74.2% of the students stated that they attended more than half of the online lectures, the daily time spent in front of technology-based devices seems to be low. In addition, this time was found to be similar in students with and without MSP. Second, correct posture may be effective in the prevalence of MSP as well as time spent in front of the computer. Future studies are needed to evaluate the relationship between posture and MSP.

Many studies reported that outbreaks such as COVID-19 increase symptoms of psychological distress and depression (17,18). In a previous study conducted at Ankara University Faculty of Medicine, depressive symptoms were found in 41% of the students (19). In our study, 83.2% of the students were reported severe depression and 16.8% of them reported moderate depression according to the BDI score. The most important reason for these increased rates is probably due to the pandemic. Since any of the students describe minimal or moderate depression according to BDI scores, the parameters that might have an effect on depression couldn't be evaluated in this study. However, BDI scores were found to be higher in all students with neck, upper back, lower back, and shoulder pain in the last week compared to those without. Studies examining the relationship between MSP and depression in medical school students generally evaluated the presence or absence of mental stress (20,21). In this sense, our study is valuable in terms of

using a standardized scale to measure depression. Although the high BDI scores in patients with MSP are important in terms of showing the relationship between these two factors, it is impossible to know whether these symptoms occurred before or after the onset of pain.

In our study, while low physical activity was related to upper back and lower back pain, not related to neck and shoulder pain. In the literature, there are different results in studies evaluating the relationship between physical activity level and MSP. First of all, the definition of physical activity has varied among many researchers and is not derived from objective data (4,22). In studies in which physical activity levels were questioned by validated questionnaires such as ours, the results differ. In line with our results, Scarabottolo et al. (23) showed that lack of physical activity was associated with lower back and neck pain. Also, Wedderkopp et al. (24) stated that high-level physical activity in childhood seems to protect against lower back pain in early adolescence. However, Balagué et al. (25) reported that adolescents, who were involved in sports programs, had higher chances of the occurrence of lower back pain. In this context, the findings in the literature are not clear.

MSP is a major cause of chronic pain that may affect the quality of life. Our study showed that the quality of life of the students who experienced neck, upper back, lower back, and shoulder pain was significantly lower than the students who did not. In this context, it has been found that low back pain has a significant effect on all aspects of students' quality of life.

Study Limitations

There are several limitations of this study. First, the number of participants responding to the survey was low and did not reflect the entire student population. While it was aimed to reach a student population of nearly 2000 in total, only 233 students responded to the survey. In addition, since only students who met the inclusion criteria could participate in the online survey, it could not be determined how many students were excluded because they did not meet the inclusion criteria.

Conclusion

In conclusion, the prevalence of MSP was very high among medical students receiving online education during the COVID-19 pandemic. Depressive symptoms were more pronounced in students with MSP and it was evident that the MSP affected the quality of life negatively. Preventive measures should be considered to reduce MSP in this population.

Ethics

Ethics Committee Approval: This study was approved by the Ankara University Faculty of Medicine Students Ethics Committee (date: 25/03/2021, number: 79366).

Informed Consent: All patients provided informed consent and the study was carried out in compliance with the principles of the Declaration of Helsinki.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: S.G., Ş.K., Design: S.G., Data Collection or Processing: B.H.U., E.A., E.M., B.K., B.A.K., Ş.A., M.N., Analysis or Interpretation: S.G., İ.K., Literature Search: S.G., Writing: S.G.

Conflict of Interest: We declare that there is no conflicts of interest associated with this publication.

Financial Disclosure: We declare that we have not received any financial support to perform this study.

References

1. Cao W, Fang Z, Hou G, et al. The psychological impact of the COVID-19 epidemic on college students in China. Psychiatry Res. 2020;287:112934.

2. Baker R, Coenen P, Howie E, et al. The Short Term Musculoskeletal and Cognitive Effects of Prolonged Sitting During Office Computer Work. Int J Environ Res Public Health. 2018;15:1678.

3. Eltayeb S, Staal JB, Kennes J, et al. Prevalence of complaints of arm, neck and shoulder among computer office workers and psychometric evaluation of a risk factor questionnaire. BMC Musculoskelet Disord. 2007;8:68.

4. Morken T, Magerøy N, Moen BE. Physical activity is associated with a low prevalence of musculoskeletal disorders in the Royal Norwegian Navy: a cross sectional study. BMC Musculoskelet Disord. 2007;8:56.

5. Gureje O, Von Korff M, Kola L, et al. The relation between multiple pains and mental disorders: results from the World Mental Health Surveys. Pain. 2008;135:82-91.

6. Alshagga MA, Nimer AR, Yan LP, et al. Prevalence and factors associated with neck, shoulder and low back pains among medical students in a Malaysian Medical College. BMC Res Notes. 2013;6:244.

7. Kahraman T, Genç A, Göz E. The Nordic Musculoskeletal Questionnaire: cross-cultural adaptation into Turkish assessing its psychometric properties. Disabil Rehabil. 2016;38:2153-60.

8. Saglam M, Arikan H, Savci S, et al. International physical activity questionnaire: reliability and validity of the Turkish version. Percept Mot Skills. 2010;111:278-284.

9. BECK AT, WARD CH, MENDELSON M, et al. An inventory for measuring depression. Arch Gen Psychiatry. 1961;4:561-571.

10. Hisli N. Beck Depresyon Envanterinin Üniversite öğrencileri için geçerliliği güvenilirliği. Psikoloji Dergisi. 1989;7:3-13.

11. Koçyiğit H, Aydemir Ö, Fişek G, et al. Kısa form-36 (KF36)'nın Türkçe versiyonunun güvenilirliği ve geçerliliği. İlaç ve Tedavi Dergisi. 1999;12:102-106.

12. Smith DR, Leggat PA. Prevalence and distribution of musculoskeletal pain among Australian medical students. J Musculoskeletal Pain. 2007;15:39-46.

13. Smith DR, Wei N, Ishitake T, et al. Musculoskeletal disorders among Chinese medical students. Kurume Med J. 2005;52:139-146.

14. Oha K, Animägi L, Pääsuke M, et al. Individual and work-related risk factors for musculoskeletal pain: a cross-sectional study among Estonian computer users. BMC Musculoskelet Disord. 2014;15:181.

15. Rajagopal V, Rosli RM, Rintai P, et al. The prevalence of computer-related musculoskeletal pain among college students: a cross-sectional study. Am Med J. 2012;3:33-36.

16. Mehmood M, Yaqoob U, Ali SS, et al Frequency of musculoskeletal pain and associated factors among undergraduate students. Case Rep Clin Med. 2018;7:131-145.

17. Brooks SK, Webster RK, Smith LE, et al. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. Lancet. 2020;395:912-920.

18. Venkatesh A, Edirappuli S. Social distancing in covid-19: what are the mental health implications? BMJ. 2020;369:m1379.

19. Öncü B, Şahin T, Özdemir S, et al. Tıp fakültesi öğrencilerinde depresyon, anksiyete ve stres düzeyleri ve ilişkili etmenler Kriz Dergisi. 2013;21:1-10.

20. Dighriri YH, Akkur MA, Alharbi SA, et al. Prevalence and associated factors of neck, shoulder, and low-back pains among medical students at Jazan University, Saudi Arabia: A cross-sectional study. J Family Med Prim Care. 2019;8:3826-3831.

21. Algarni AD, Al-Saran Y, Al-Moawi A, et al. The Prevalence of and Factors Associated with Neck, Shoulder, and Low-Back Pains among Medical Students at University Hospitals in Central Saudi Arabia. Pain Res Treat. 2017;2017:1235706.

22. Haroon H, Mehmood S, Imtiaz F, et al. Musculoskeletal pain and its associated risk factors among medical students of a public sector University in Karachi, Pakistan. J Pak Med Assoc. 2018;68:682-688.

23. Scarabottolo CC, Pinto RZ, Oliveira CB, et al. Back and neck pain prevalence and their association with physical inactivity domains in adolescents. Eur Spine J. 2017;26:2274-2280.

24. Wedderkopp N, Kjaer P, Hestbaek L, et al. High-level physical activity in childhood seems to protect against low back pain in early adolescence. Spine J. 2009;9:134-141.

25. Balagué F, Bibbo E, Mélot C, et al. The association between isoinertial trunk muscle performance and low back pain in male adolescents. Eur Spine J. 2010;19:624-632.