

STRESS AMONG INTERNATIONAL MEDICAL STUDENTS DURING COVID-19 PANDEMIC: A CROSS-SECTIONAL STUDY

STRES KOD INTERNACIONALNIH STUDENATA MEDICINE TOKOM KOVID-19 PANDEMIJE: STUDIJA PRESEKA

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Abstract

Introduction: The aim of this study was to investigate the prevalence of stress among international medical students and factors associated with higher levels of student's stress during the COVID-19 epidemic in Serbia.

Material and methods: The cross-sectional study was conducted using a five-section online questionnaire during January, 2021 among international medical students attending the Faculty of Medicine University of Belgrade, Studies in English in Serbia, using snowball sampling method.

Results: A total of 52 international medical students with a mean age of 21.0 ± 2.2 years, 58% female, were enrolled. Stress level was rated higher than usual in 65% of students. The predictors of higher level of stress were: not being prepared for full online courses ($p = 0.058$), worry about own health ($p = 0.04$), worry about the health of loved ones ($p = 0.058$), concern about finances ($p = 0.004$) and exams/future study plans ($p = 0.033$), lack of energy ($p = 0.012$), strong emotions or mood swings ($p = 0.004$) and inability to get needed things from stores ($p = 0.054$). Fear or worry about the health of their loved ones, concern about money, as well as concern about exams or future study plans were independent predictors of the respondents' higher level of stress in multivariate analysis.

Conclusion: The COVID-19 pandemic has led to an increase in the level of stress among the international medical students in Serbia. A higher level of stress was associated with fear about health of loved ones, concern about finances and exams/future study plans.

Keywords:

medical students,
international,
COVID-19,
stress

Sažetak

Uvod: Cilj rada je ispitivanje prevalencije stresa i faktora koji su udruženi sa povišenim nivoom stresa kod internacionalnih studenata medicine tokom epidemije KOVID-19 u Srbiji.

Materijal i metode: Studija je sprovedena kao studija preseka, sa korišćenjem onlajn upitnika tokom januara 2021. godine među internacionalnim studentima medicine koji pohađaju studije engleskog jezika na Medicinskom fakultetu Univerziteta u Beogradu. Uzorak je formiran po tipu grudve snega (engl. *snowball*).

Rezultati: U studiju su uključena 52 studenta, prosečne starosti 21 ± 2 godine, pretežno ženskog pola (58%). Nivo stresa viši od uobičajenog prijavilo je 65% studenata. Prediktori povišenog nivoa stresa su bili: nepripremljenost za onlajn nastavu ($p = 0,058$), briga za sopstveno zdravlje ($p = 0,04$), briga za zdravlje voljenih ($p = 0,058$), briga za finansije ($p = 0,004$), briga oko ispita/budućih planova u vezi sa studiranjem ($p = 0,033$), nedostatak energije ($p = 0,012$), jake emocije ili česte promene raspoloženja ($p = 0,004$) i nemogućnost obavljanja kupovine ($p = 0,054$). Briga za zdravlje voljenih, briga oko finansija i ispita/budućih planova u vezi sa studiranjem bili su prediktori prisustva visokog nivoa stresa u multivarijantnoj analizi.

Zaključak: Pandemija KOVID-19 je dovela do povišenog nivoa stresa kod internacionalnih studenata medicine u Srbiji. Viši nivo stresa bio je udružen sa brigom za zdravlje najbližih, brigom oko finansija i ispita/budućih planova u vezi sa studiranjem.

Ključne reči:

studenti medicine,
internationalni,
KOVID-19,
stres

Introduction

The novel corona virus disease (COVID-19) has rapidly spread since it emerged in 2019 in Wuhan, China, and caused physical, social and educational changes worldwide, more than any other event has this century (1, 2). On March 15th, 2020, a state of emergency was declared in Serbia (3). A nine-hour nationwide curfew was introduced prohibiting citizens from leaving their homes and all schools, including universities, were closed. The entire educational system faced an unprecedented and difficult situation. With "home isolation" and "social distancing" becoming the norm, numerous lectures/classes for medical students were cancelled or moved to online learning, leading to a huge change in medical education. Clinical rotations were interrupted with reduced face-to-face interaction with patients. This COVID-19 educational "revolution" has raised uncertainty and anxiety among medical students, laying challenges ahead of them they never had to face until now (2).

Even though the focus of public health measures was to protect patients and communities, the emergence of COVID-19 has introduced immense uncertainty to medical students, with international medical students being one of the most vulnerable groups. Students had encountered the problem of not being able to return home, or whether they would ever be able to return to class (4). Worries about issues like their own health and health of their loved ones, food procurement, finances or completing their credential as planned made everyday life harder (5). New stressors were added to the already existing ones, affecting students' mental health negatively (6).

The way of representing stress can be cognitive, emotional, physical and behavioral (7). Also, there are different ways of coping with stressful situations (8). The

importance of looking into the effects of COVID-19 on university students' mental health and stress has been recognized in several previous studies. They found that the COVID-19 pandemic related stressors are associated with anxiety (9). Concerns about their own and their loved ones health, difficulties in concentrating, sleeping problems, social distancing and academic performances were defined as factors influencing stress, anxiety and depression among students during the pandemic (10). The most common emotional symptoms of stress during the pandemic were anxiety, sadness and anger, and they could be punctual or extended after the end of isolation (11). A study by Esteves et al. showed that stress was the most common out of all explored symptoms, according to the DASS-21 scale among Brazilian students during the COVID-19 pandemic (12).

There were few studies that assessed the perceptions of stress and coping strategies among medical students during the COVID-19 pandemic in the world (13,14). To our knowledge, this is the first study conducted among foreign medical students in Serbia facing exceptional and complicated circumstances due to the pandemic. The aim of this study was to investigate the prevalence of stress within international medical students attending the Studies in English at the University of Belgrade, Faculty of Medicine, and factors associated with higher levels of student's stress during the COVID-19 epidemic in Serbia.

Materials and methods

This was a cross-sectional study conducted using an online questionnaire during January, 2021 among international medical students attending the Faculty of Medicine University of Belgrade, Studies in English, using snowball sampling method. Participation was voluntary and anonymous.

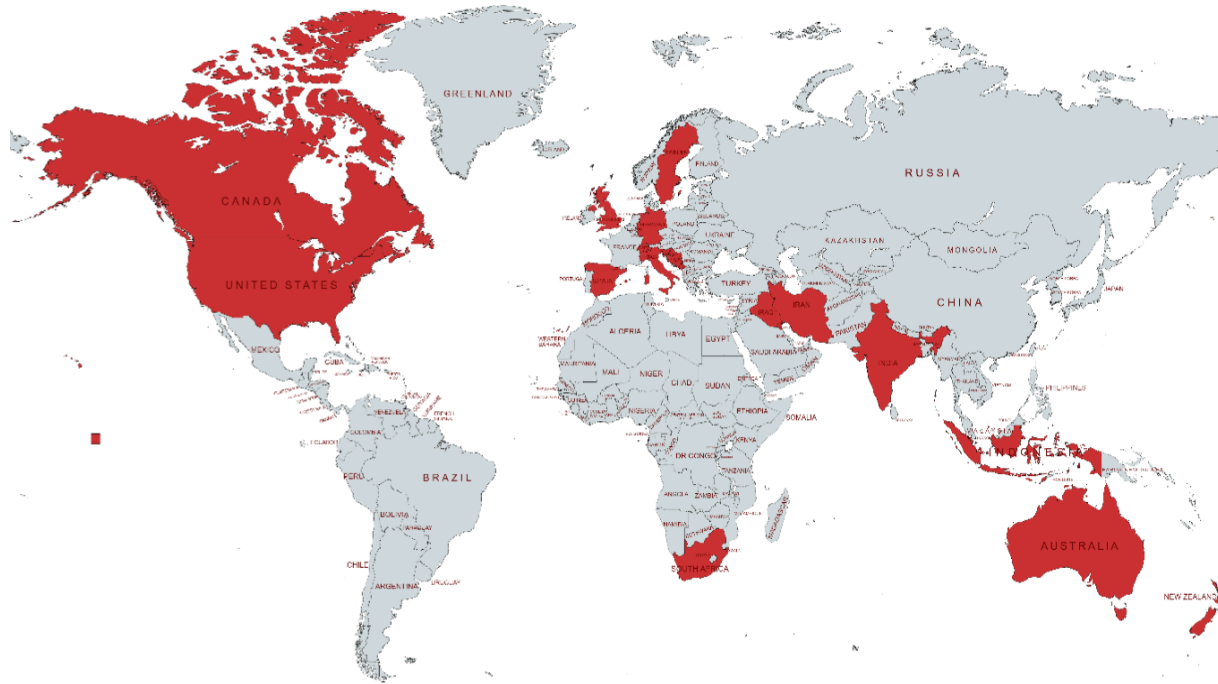


Figure 1. Distribution of the respondents by citizenship

A semi-structured online questionnaire designed by faculty members was administered to students. The online survey included five sections. The first section consisted of questions related to students' age, gender, and citizenship. The second part included questions about pressures and worries of students in light of the challenges they had to face during the COVID-19 pandemic. The third one included questions related to the level of stressful life circumstances during the pandemic. The fourth part included questions related to difficulties in stress management. Lastly, the fifth part included questions related to ways in which the students coped with stress during the pandemic. Questions about specific resources and technological apps, as well as physical and mental exercises, were included in order to identify the students' coping mechanisms.

Statistical analysis

Categorical variables were described using absolute and relative numbers. Numerical data were presented as mean with standard deviation. Mathematical (coefficient of variation, skewness, kurtosis, and Kolmogorov-Smirnov and Shapiro Wilk tests) and graphical methods (histogram, box plot) were used to test the normality of data distribution. Logistic regression analysis was used to assess potential predictors of higher levels of stress during the COVID-19 pandemic. In all analyses, the significance level was set at 0.05. Statistical analysis was performed using IBM SPSS statistical software (SPSS for Windows, release 21.0, SPSS, Chicago, IL).

Results

The questionnaire was completed by 52 students attending Faculty of Medicine University of Belgrade, Studies in English. The mean age of respondents was

21.0 ± 2.2 years, and more than a half of the participants were female (57.7%).

Most of the students were from Canada (28.8%), United States (9.6%) and Sweden (9.6%) (**figure 1**). Other represented countries were: Germany, Montenegro, Iran, Switzerland, India, Australia, Indonesia, United Kingdom, Croatia, Slovenia, Bosnia and Herzegovina, Iraq, Kuwait, New Zealand, Italy, Spain and South Africa. Almost all of the respondents spent the COVID-19 pandemic in Serbia (90.4%), and only 9.6% went home to be with their family. Twenty-eight students (53.8%) responded that they were afraid of not being able to travel back home.

Only 21.2% of the respondents thought that online courses could deliver knowledge as well as traditional methods of learning. Female students were more prepared for full online courses than male respondents and considered online courses could deliver knowledge as well as traditional methods of learning ($p = 0.023$ and $p < 0.001$, respectively). Female students studied more productively from home than male students ($p = 0.030$). Despite having difficulties studying productively from home, the majority of students were able to complete their credentials as planned (76.9%); thirty-nine students (75%) stated they could not do the day-to-day things they liked to do, and 51.9% of them felt like they did not have motivation or support during the COVID-19 pandemic. One third of the respondents stated they could not see a doctor or therapists, 28.8% could not get things they needed from stores or online shopping, and 15.4% could not get healthy food (**table 1**).

Stress level was rated higher than usual in 65% of students, about the same as usual in 25.9%, and lower than usual in 7.7% of medical students. In terms of the COVID-19 stressful situation, more than half of the students answered they worried about their own health

Table 1. Distribution of students' answers about COVID-19 challenges within gender

Variable	n (%)	Gender (n, %)		p*
		Male	Female	
Afraid of not being able to travel back home				
No	24 (46.2)	16 (53.3)	8 (36.4)	0.225
Yes	28 (53.8)	14 (46.7)	14 (63.6)	
Online courses deliver knowledge as well as traditional methods of learning				
No	41 (78.8)	29 (96.7)	12 (54.5)	<0.001
Yes	11 (21.2)	1 (3.3)	10 (45.5)	
Prepared for full online courses				
No	35 (67.3)	24 (80.0)	11 (50.0)	0.023
Yes	17 (32.7)	6 (20.0)	11 (50.0)	
Studied productively from home				
No	28 (53.8)	20 (66.7)	8 (36.4)	0.030
Yes	24 (46.2)	10 (33.3)	14 (63.6)	
Completed credential as planned				
No	12 (23.1)	6 (20.0)	6 (27.3)	0.539
Yes	40 (76.9)	24 (80.0)	16 (72.7)	
Could not do the day-to-day things I like to do				
No	13 (25.0)	9 (30.0)	4 (18.2)	0.331
Yes	39 (75.0)	21 (70.0)	18 (81.8)	
Could not get healthy food				
No	44 (84.6)	26 (86.7)	18 (81.8)	0.632
Yes	8 (15.4)	4 (13.3)	4 (18.2)	
Could not get things I need from stores				
No	37 (71.2)	24 (80.0)	13 (59.1)	0.100
Yes	15 (28.8)	6 (20.0)	9 (40.9)	
Could not afford usual living expenses				
No	49 (94.2)	28 (93.3)	21 (95.5)	0.746
Yes	3 (5.8)	2 (6.7)	1 (4.5)	
Could not afford medical care and/or medications				
No	51 (98.1)	30 (100.0)	21 (95.5)	0.238
Yes	1 (1.9)	0 (0.0)	1 (4.5)	
Could not see a doctor or therapist				
No	35 (67.3)	18 (60.0)	17 (77.3)	0.190
Yes	17 (32.7)	12 (40.0)	5 (22.7)	
Did not have motivation or support				
No	25 (48.1)	11 (36.7)	14 (63.6)	0.054
Yes	27 (51.9)	19 (63.3)	8 (36.7)	

*Chi-Square or Fisher's Exact Test was used

(59.6%), and almost all feared about health of their loved ones (92.3%). Almost all of the students were worried about their exams and future study plans (96.2%). There was no statistical significance in fears and concerns by gender ($p > 0.05$) (**table 2**).

A majority of students answered they felt a lack of energy during the pandemic (86.5%) and 55.8% had difficulty with sleeping, no statistical significance was found

Table 2. Fears and concerns during COVID-19 pandemic by gender

Variable	n (%)	Gender (n, %)		p*
		Male	Female	
Fear or worry about their own health				
No	21 (40.4)	12 (40.0)	9 (40.9)	0.947
Yes	31 (59.6)	18 (60.0)	13 (59.1)	
Fear or worry about health of their loved ones				
No	4 (7.7)	2 (6.7)	2 (9.1)	0.746
Yes	48 (92.3)	28 (93.3)	20 (90.9)	
Concern about money and finances				
No	13 (25.0)	9 (30.0)	4 (18.2)	0.331
Yes	39 (75.0)	21 (70.0)	18 (81.8)	
Concern about exams or future study plans				
No	2 (3.8)	0 (0.0)	2 (9.1)	0.174
Yes	50 (96.2)	30 (100.0)	20 (90.9)	
Concern about getting the groceries and supplies				
No	31 (59.6)	15 (50.0)	16 (72.7)	0.099
Yes	21 (40.4)	15 (50.0)	6 (27.3)	

*Chi-Square or Fisher's Exact Test was used

Table 3. Difficulties in stress management during COVID-19 pandemic by gender

Variable	n (%)	Gender (n, %)		p*
		Male	Female	
Lack of energy				
No	7 (13.5)	3 (10.0)	4 (18.2)	0.438
Yes	45 (86.5)	27 (90.0)	18 (81.8)	
Difficulty sleeping				
No	23 (44.2)	12 (40.0)	11 (50.0)	0.473
Yes	29 (55.8)	18 (60.0)	11 (50.0)	
Increased use of alcohol				
No	31 (59.6)	14 (46.7)	17 (77.3)	0.026
Yes	21 (40.4)	16 (53.3)	5 (22.7)	
Poor appetite or over-eating				
No	19 (36.5)	8 (26.7)	11 (50.0)	0.084
Yes	33 (63.5)	22 (73.3)	11 (50.0)	
Strong emotions or mood swings				
No	9 (17.3)	2 (6.7)	7 (31.8)	0.018
Yes	43 (82.7)	28 (93.3)	15 (68.2)	

*Chi-Square or Fisher's Exact Test was used

between male and female gender ($p = 0.438$ and $p = 0.473$, respectively). Increased use of alcohol, as well as strong emotions or mood swings, were significantly more present in male than in female students ($p = 0.026$ and $p = 0.018$, respectively). More than half (63.5%) of students had poor appetite or were over-eating during COVID-19 pandemic, and no statistical significance was found between genders ($p = 0.084$) (**table 3**).

A majority of students coped with the COVID-19 pandemic by watching TV shows and/or movies (92.3%), and by reaching out to friends, family and/or colleagues (90.4%), with no significant difference between genders. Male students were doing home projects/yard work more often than female students in order to cope with the COVID-19 pandemic ($p = 0.013$). Female students enjoyed hobbies/played games more than male students ($p = 0.033$) (table 4).

In the univariate regression analysis, the significant predictors of higher level of stress among international students were: not being prepared for full online courses ($p = 0.058$), fear or worry about their own health ($p = 0.04$), fear or worry about health of their loved ones ($p = 0.058$), concern about money and finances ($p = 0.004$), concern about exams or future study plans ($p = 0.033$), lack of energy ($p = 0.012$), strong emotions or mood swings ($p = 0.004$) and inability to get things needed from stores ($p = 0.054$). Fear or worry about health of their loved ones, concern about money, as well as concern about exams or future study plans, were independent predictors of the respondents' higher level of stress in multivariate analysis (table 5).

Discussion

Aiming to evaluate the impact of the COVID-19 pandemic on the level of stress, an online survey was conducted among international medical students. Two thirds of students expressed higher levels of stress than before the pandemic. Worries about health of their loved ones, concern about money and concern about exams or future study plans were found to be associated with higher level of stress within foreign medical students in Serbia.

The findings of this study bring attention to the challenges experienced by medical students due to the transition from traditional to technology-based education. Out of 52 respondents, 78.8% stated that online courses could not deliver knowledge as well as traditional methods of learning - significantly more male than female students. Both male (80.0%) and female (50.0%) students felt unprepared

Table 4. Distribution of students' answers about coping with the COVID-19 situation within gender

Variable	n (%)	Group (n, %)		p*
		Male	Female	
Reaching out to friends, family and colleagues				
No	5 (9.6)	3 (10.0)	2 (9.1)	0.913
Yes	47 (90.4)	27 (90.0)	20 (90.9)	
Using video calls to "meet" friends or/and family				
No	8 (15.4)	5 (16.7)	3 (13.6)	0.756
Yes	44 (84.6)	25 (83.3)	19 (86.4)	
Getting some exercise				
No	19 (36.5)	10 (33.3)	9 (40.9)	0.575
Yes	33 (63.5)	20 (66.7)	13 (59.1)	
Doing yoga/meditation				
No	36 (69.2)	23 (76.7)	13 (59.1)	0.175
Yes	16 (30.8)	7 (23.3)	9 (40.9)	
Enjoyed hobbies/played games				
No	18 (34.6)	14 (46.7)	4 (18.2)	0.033
Yes	34 (65.4)	16 (53.3)	18 (81.8)	
Reading and/or writing				
No	29 (55.8)	15 (50.0)	14 (63.6)	0.328
Yes	23 (44.2)	15 (50.0)	8 (36.4)	
Watching TV				
No	4 (7.7)	3 (10.0)	1 (4.5)	0.466
Yes	48 (92.3)	27 (90.0)	21 (95.5)	
Doing home projects/yard work				
No	25 (48.1)	10 (33.3)	15 (68.2)	0.013
Yes	27 (51.9)	20 (66.7)	7 (31.8)	

*Chi-Square or Fisher's Exact Test was used

for online courses. Preparedness for full online courses differed significantly between genders. These findings are in line with a previous study conducted on medical students in the United Kingdom, where a majority of students felt as though

Table 5. Predictors of higher-level stress among foreign students in univariate and multivariate logistic regression analysis

Predictor	Univariate			Multivariate		
	OR	95% CI for OR	p	OR	95% CI for OR	p
Prepared for full online courses	0.3	0.1-1.0	0.058			
Fear or worry about their own health	2.9	1.0-7.8	0.04			
Fear or worry about health of their loved ones	2.7	1.0-7.4	0.058	9.7	2.1-44.9	0.057
Concern about money and finances	5.1	1.7-15.2	0.004	13.3	2.9-61.0	0.010
Concern about exams or future study plans	3.6	1.1-11.9	0.033	4.5	1.0-21.4	0.057
Lack of energy	3.6	1.3-9.8	0.012			
Strong emotions or mood swings	4.3	1.6-11.4	0.004			
Could not get things I need from stores	5.0	1.0-25.1	0.054			

online learning implemented during the COVID-19 pandemic was neither enjoyable nor as effective as face-to-face teaching (15). Online learning requires a greater degree of self-motivation and the ability to keep oneself on-track with deadlines and studying. Almost half of the medical students were able to study productively from home, which is in line with a study carried out on college students in the United States. Forty-six percent (46%) of students had difficulty studying at home during the COVID-19 lockdown, as being around family made it difficult to concentrate (16). Despite these challenges, 76.9% of students were able to complete their credentials as planned. In a study conducted on veterinary medical students across 92 countries, 96.7% of respondents stated that their academic performance was affected by the COVID-19 lockdown, and nearly half (47.5%) being severely affected (17).

Students were not only facing stress and uncertainty associated with their academic performance and learning, but also with the restrictions that would affect their day-to-day lives. The restrictions implemented in Serbia limited the amount of time people were able to spend outside of their homes, limited gatherings of people not being from same households, and only essential businesses (i.e. grocery stores, pharmacies) remained opened (3). Thirty-nine students (75%) stated that they could not do the day-to-day things they like to do, 51.9% did not have motivation or support, and 32.7% could not see a doctor, therapist, or other healthcare provider. Approximately 40% of female students and 20.0% of male students were unable to get things that they need from the store or via online shopping.

While it is widely known that psychological distress and mental health issues are prevalent among medical students (7-9), the academic and day-to-day challenges experienced by students during the COVID-19 pandemic contributed to even higher levels of stress. According to our results, 65.4% of students defined a stress level "higher than usual". Similar findings were obtained in studies carried out in different countries (10,12,13). Almost all students were concerned about exams or future study plans (96.2%) and worried about the health of their loved ones (92.3%). This is in line with a study performed by Mertens et al., which reported that the biggest concern of respondents was the health of others such as grandparents and friends (18). This is not surprising, due to the fact that students do not belong to high-risk group for COVID-19; therefore, they worried much more for the health of their loved ones than for their own health. Lack of energy and strong emotions or mood swings were the most frequent difficulties in stress management among the medical students. Increase in alcohol use and strong emotions or mood swings were more frequent in male students. In a study conducted in Spain, it was found that women were more affected by mood swings during the lockdown (14), different from our study results. According to a study conducted in Indonesian college students, students with poor sleep quality are almost five times more likely to feel high levels of stress (19). This result is consistent with the findings in our study, where more than half

of students experienced difficulties with sleeping during the COVID-19 pandemic. It is known that lack of sleep leads to more frequent mood swings, greater anxiety, nervousness, depression and stress in general population, as well as among students. In a study about eating problems among students during the lockdown, it was found that stress related to the lockdown was associated with greater likelihood of binge eating and dietary restriction with female gender as one of risk factors (20). This is in opposite to our study results, where 63.5% of students had poor appetite or were over-eating, more frequently among male than female students.

Watching TV (92.3%), reaching out and using video to "meet" friends, family and/or colleagues (90.4% and 84.6%) were the most common coping mechanisms among medical students. As well as in our study, Shaikh et al. found out that Pakistani medical students used sports, music, hanging out with friends, and sleeping as activities for avoiding stress (21).

Conclusion

The COVID-19 pandemic has led to an increase in the level of stress among the international medical students in Serbia. Worries about the health of their loved ones, concern about money and concern about exams or future study plans were found to be associated with higher levels of stress within foreign medical students in Serbia.

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