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Original Scientific Paper

ADVERSE MENTAL HEALTH OUTCOMES IN MEDICAL STUDENTS IN SERBIA DURING THE COVID-19 PANDEMIC

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SUMMARY – The specificities of student population may lead to an increased risk of adverse mental health outcomes during the COVID-19 pandemic. The aim was to evaluate the levels of perceived stress, anxiety, and depression in medical students during COVID-19 lockdown, and the relationship of these constructs with various sociodemographic variables. The study was conducted online from April 20 to April 29, 2020, during the first COVID-19 pandemic lockdown (using sociodemographic questionnaire and DASS-21 scale), on a sample of 420 students (female 81.7%, M_{age}=22.53) at the University of Kragujevac. The majority of participants (55%-58%) had no self-reported symptoms of depression, anxiety or stress, and the mean values were in-between the categories of 'without any symptoms' and 'with mild symptoms'. Predictors of exhibiting depression symptoms were previous psychological problems (odds ratio [OR]=3.16), family history of mental illness (OR=2.12), and relationship status (OR=0.61). For the symptoms of anxiety, predictors were female gender (OR=2.38), reported previous psychological problems (OR=3.91), and age (OR=0.92). Predictors of the symptoms of stress were female gender (OR=2.31), previous psychological problems (OR=3.18), and age (OR=0.91). The results of our study imply that certain factors influence the development of adverse mental health outcomes during this period, which should be taken into account when planning psychological interventions and services.

Key words: *COVID-19; University students; Anxiety; Depression; Stress*

Introduction

The first case of COVID-19 was reported in Serbia on March 6, 2020, with a nationwide lockdown beginning ten days later, and lasting until May 7, 2020. Unlike other countries, Serbia required persons older than 65 to stay at home, while the remaining population had to stay at home from 3 p.m. to 5 a.m., which was subsequently reduced to the period from 6 p.m. to 5 a.m. These measures required Serbian population to adapt to the new online mode of life.

Other than physical threat of the pandemic, anxiety, depression and stress are also more pronounced in people during the period of quarantine[1]. Mental health professionals and World Health Organization maintain that the pandemic and new measures such as self-isolation and quarantine may impact mental health of the population globally, with an increase in cases of loneliness, anxiety, depression, insomnia, harmful alcohol and drug use, self-harm, and obsessive-compulsive disorders (e.g., consistent

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handwashing)[2]. Moreover, lockdown has created boredom and monotony, but on the other hand, people are also getting an information overload through constant streaming of verified and unauthenticated information[2].

Specificity of the student population

For many students, going to university is a transitional period leading to unfamiliar environments, when commencing a new life, and in some cases going away from parents or friends[3]. Measures of physical distancing, lockdown, social isolation, and quarantine, which were introduced in many countries in response to the COVID-19 crisis, forced the educational institutions to change their working format to an online or distance learning mode. These changes have led to disturbances to the educational process and further increase in academic stressors for students. The possible consequences arise in the reorganization of learning activities, reduced motivation towards studies, increased pressures to learn independently, abandonment of daily routines, etc.[4-6]. The pandemic places demand on students and teachers to adapt to online teaching, however, sometimes with limited resources or knowledge, thus resulting in stress levels above normal[7]. As additional hindering factors, the lack of technological resources, weak internet connection, and inappropriate learning environments were found in recent studies[8]. Studies also stress the importance of specific aspects of social support, e.g., a study carried out in the USA showed that 37% out of a third of young participants who reported symptoms of elevated anxiety and depression also stated low family support, or feeling lonely during the first months of the pandemic[9]. These changes require constant psychological adaptation which in some cases exceeds student capacity of coping with the situation[3].

In a study conducted in China[10], 25% of the student participants reported experiencing anxiety symptoms, with positive correlation with increased concerns about academic delays, economic effects of the pandemic, and impacts on daily life. Kaparounaki *et al*. report that there was an increase in scores for anxiety, depression, and suicidal thoughts in the student population during the first days of the lockdown in Greece[11]. The same study also confirmed that the quality of life worsened in 57% of the participants, and although the quantity of sleep increased, its quality decreased in 43% of the sample. Student concerns during the COVID-19 crisis increased the likelihood of post-traumatic stress disorder by 30%, while student positive beliefs decreased it by 10% in a study performed on Italian university population[5]. The level of student health engagement (responsibility in managing their own health) mitigated these effects. Studies on the general population also report an increase of anxiety, depression, stress and other mental health issues during COVID-19 lockdowns[12,13]. Students, researchers, teachers, and health professionals reported mild levels of stress, and mild/moderate levels of anxiety in academic staff in India[14]. Some of those studies report higher scores in stress, anxiety, and depressive symptoms in younger population compared to older ones[13,15,16], probably since students are more socially mobile and may have perceived their academic, social, occupational, and economic prospects to be more threatened by COVID-19 pandemic circumstances[16]. Finally, there are several issues that are more prominent among medical as opposed to other university undergraduates. In a study by Gazibara *et al*., medical students in final years of training perceived their general stress level as moderate or high, and the quality of life dimensions as lower than other undergraduates[17].

The aim of this cross-sectional study was to evaluate the levels of stress, anxiety, and depression in medical students during the lockdown period of COVID-19 pandemic in Serbia, and potential relationship of these constructs with some of the sociodemographic variables. The study participants were medical students because certain topics in the educational process are much more challenging to deliver online, especially those with practical and clinical aspects that relate to health sciences[6].

Method

Procedure

The study was conducted online from April 20 to April 29, 2020, during the first COVID-19 pandemic lockdown. The link to the Google Forms type of survey was posted on the Faculty official web page. The questionnaires were not sent to individual e-mails to ensure anonymity. No identifying information was collected, and participants were informed that they could withdraw from the study at any time. The study protocol was approved by the Ethics Committee, Faculty of Medical Sciences, University of Kragujevac,

and it conformed to the provisions of the Declaration of Helsinki. Informed consent was obtained from all participants included in the study and their anonymity was preserved. There were around 1200 eligible students, 517 took part in the survey, however, we included 420 with fully completed questionnaires.

Participants

The voluntary sample comprised 420 students (female 81.7%, M_{age}=22.53, standard deviation [SD]=3.65) from the Faculty of Medical Sciences, University of Kragujevac, Serbia. The majority of the participants assessed their economic status as middle (40.5%), or middle to high (23.1%). Approximately half of the participants (50.7%) were in a relationship. Some somatic problems were reported by 9.3% of the students, 5.5% reported some psychological problems, while 14% of the students reported a family history of mental disorders. Also, 18.6% of the participants used some medication, while 16.9% were active smokers, and 32.6% alcohol consumers.

Instruments

The participants were asked to fill out basic sociodemographic data (age, sex, economic and relationship status, somatic and psychological problems, family history of mental disorders, smoking, alcohol and drug use), and Depression Anxiety Stress Scale (DASS-21). DASS-21 is comprised of three subscales with seven items each, which evaluate perceived levels of three negative emotional states: depression, anxiety, and stress, over the past two weeks[18]. The scale is in a 4-point Likert–type format (from 0 – "did not apply to me at all", to 3 – "applied to me very much or most of the time"), and the scores range from 0 to 21 for every subscale. A higher score indicates a greater level of depression, anxiety, and stress. Scores of ≤4 for depression, ≤3 for anxiety and ≤7 for stress were considered as normal. The study used the Serbian version of the scale[19], which showed good internal consistency in our study (α_{total}=0.94, α_d=0.81, α_a=0.84, α_s=0.83).

Statistical analyses

Besides basic descriptive statistical analyses, Spearman's correlation coefficient was used to determine correlations between numerical variables, while the Mann Whitney U test was used to determine differences in means. Univariate and multivariate binary regression analyses were performed to identify the predictors of DASS-21 scores. SPSS 21 was used on statistical analyses.

Results

As shown in Table 1, the mean values for anxiety, depression, and stress were in-between 'without any symptoms' and 'with mild symptoms' categories (depression 4.82±4.37, anxiety 3.88±3.68, stress 7.67±4.67). However, over 40% of the participants reported some symptoms of depression, anxiety, or stress.

Furthermore, the results presented in Table 2 confirmed that female participants had higher scores of anxiety (Z(418)=-2.56, p=0.010) and stress (Z(418)=-2.66, p=0.008). Depression and participant age were not correlated (r=-0.077, p=0.117), while the levels of anxiety and age correlated negatively (r=-0.17, p<0.0005), similar to the levels of stress and participant age (r=-0.11, p=0.025).

In further analyses, the participants were separated into two groups for all three constructs (depression, anxiety and stress). One of the groups were participants without reported symptoms, and the other group were participants with reported symptoms for the given construct (cut-off values: depression score >4, anxiety score >3, and stress score >7). After grouping, we conducted univariate and then multivariate binary regression analyses to determine which factors were significant predictors of symptoms of each of the three constructs (Table 3).

Our analyses showed that the participants with reported previous psychological problems had 3.19 higher odds of having symptoms of depression during the targeted period. At the same time, the participants with family history of mental illness had 2.12 higher odds, while persons in relationship had 0.6 less odds of having symptoms of depression (Table 3). Female gender increased the odds of symptoms of anxiety by 2.38, and previous psychological problems by 3.91. Older students reported less symptoms of anxiety (0.9 odds). Females had 2.31 higher odds of reporting symptoms of stress, persons with previous psychological problems had 3.18 higher odds, and the participants using medications 1.83 higher odds. Older students were less likely to report stress symptoms (less chance by 0.9).

Table 1. Percentage of participants according to category of reported symptoms

	Depression	Anxiety	Stress
Without symptoms	244 (58.0%)	238 (56.7%)	233 (55.5%)
Mild	67 (16.0%)	76 (18.1%)	47 (11.2%)
Moderate	63 (15.0%)	32 (7.6%)	66 (15.7%)
Severe	20 (4.8%)	37 (8.8%)	54 (12.9%)
Extremely severe	26 (6.2%)	37 (8.8%)	20 (4.8%)
Total with symptoms	176 (42.0%)	182 (43.3%)	187 (44.5%)

Table 2. Descriptive statistics on depression, anxiety, and stress according to categories

Variable		n	Depression		Anxiety		Stress	
			Mean ± SD	p	Mean ± SD	p	Mean ± SD	p
Sex	M	77	4.60±4.01	0.832	3.04±3.43	0.010	6.47±4.55	0.008
	F	343	4.87±4.46		4.06±3.71		7.94±4.66	
In relationship	No	207	5.36±4.52	0.011	4.01±3.92	0.433	7.73±4.69	0.794
	Yes	213	4.30±4.17		3.74±3.44		7.61±4.66	
Psychological problems	No	397	4.58±4.13	<0.001	3.68±3.49	<0.001	7.41±4.51	<0.001
	Yes	23	9.04±6.07		7.27±5.13		12.17±.24	
Drug therapy	No	342	4.51±4.12	0.008	3.54±3.26	0.004	7.31±4.38	0.006
	Yes	78	6.19±5.16		5.36±4.88		9.28±5.54	
Mental disorder in family	No	361	4.37±3.93	<0.001	3.59±3.41	0.003	7.33±4.45	0.002
	Yes	59	7.61±5.74		5.61±4.70		9.80±5.44	
Cigarettes	No	349	4.66±4.35	0.037	3.70±3.54	0.056	7.53±4.66	0.111
	Yes	71	5.62±4.44		4.72±4.22		8.39±4.69	
Alcohol	No	283	4.61±4.45	0.023	3.78±3.67	0.264	7.45±4.76	0.100
	Yes	137	5.26±4.20		4.07±3.71		8.14±4.46	
Psychoactive substances	No	413	4.74±4.31	0.007	3.84±3.60	0.550	7.64±4.66	0.452
	Yes	7	9.71±5.77		6.00±7.23		9.29±5.41	

M = male; F = female; SD = standard deviation

Table 3. Univariate and multivariate binary regression analyses of factors influencing the occurrence of depression, anxiety and stress

	Univariate binary regression		Multivariate binary regression	
	Odds ratio (95% CI)	p	Odds ratio (95% CI)	p
Depression				
Psychological problems	4.241 (1.637-10.989)	0.003	3.188 (1.197-8.488)	0.020
Mental disorder in family	2.471 (1.405-4.345)	0.002	2.118 (1.179-3.804)	0.012
In relationship	0.594 (0.401-0.878)	0.009	0.609 (0.408-0.907)	0.015
Drug therapy	1.699 (1.036-2.786)	0.036		
Psychoactive substances	8.578 (1.023-71.886)	0.048		
Anxiety				
Age	0.917 (0.859-0.980)	0.010	0.921 (0.858-0.983)	0.014
Female	2.186 (1.276-3.743)	0.004	2.383 (1.361-4.172)	0.002
Psychological problems	3.181 (1.280-7.904)	0.013	3.909 (1.509-10.127)	0.020
Drug therapy	1.794 (1.036-2.786)	0.021		
Cigarettes	1.756 (1.050-2.935)	0.032		
Stress				
Age	0.915 (0.857-0.977)	0.008	0.914 (0.854-0.979)	0.009
Female	2.151 (1.264-3.662)	0.005	2.305 (1.313-4.046)	0.004
Psychological problems	3.783 (1.461-19.799)	0.006	3.175 (1.127-8.945)	0.029
Drug therapy	1.921 (1.167-3.160)	0.010	1.827 (1.078-3.096)	0.025
Mental disorder in family	2.177 (1.05239-3.824)	0.007	1.848 (1.019-3.351)	0.043
Somatic disorder	2.140 (1.088-4.208)	0.027		

CI = confidence interval

Discussion

Our results on the prevalence of perceived symptoms of depression, anxiety and stress were in concordance with the results of other studies. A study in Spain reported that 35.18%, 48.10% and 40.32% of respondents exhibited signs of anxiety, depression, and stress, respectively, with the highest number of respondents (76.8%) being students[12]. Our study recorded moderate to extremely severe scores in 21.34% of the respondents for anxiety, 34.19% for depression, and 28.14% for stress. Similar results were found in studies on student populations in Greece and China[10,11]. In a study carried out in the USA[9], which included younger people (18 to 30 years of age), at least a third of the participants reported having clinically elevated levels of depression (43.3%), anxiety (45.4%), and post-traumatic stress disorder symptoms (31.8%). All of these findings suggest that the levels of negative emotional reactions induced by a stressful situation during the early phase of the crisis caused by the COVID-19 pandemic were quite high in the student population, which should be the cause for concern.

Certain characteristics of students were significant risk factors for negative psychological impact during the COVID-19 pandemic. Thus, age, gender, and previous

psychological problems were marked as risk factors in our study, which is similar to the observations presented in other studies on this topic. Namely, depression scores of single female students between 18 and 29 years of age, with income lower than their expenses were found to be higher than in other participants in a study conducted in Turkey[20]. Young female participants with inadequate financial resources, and self-reported disabilities reported the most severe symptoms in a study on a USA national sample[13]. Furthermore, it is worth noting that not all students have enough technological knowledge and support that enable smooth transition to online learning, which may have a negative effect on student performance[14]. The lack of social support can also be one of the risk factors, since a study carried out in the USA showed a relation between the symptoms of elevated anxiety and depression, and low family support and loneliness during the pandemic[9]. In our study, out of social factors, only being single was found to increase the odds of depressive symptoms. The study also found higher resilience to be a protective factor[21].

The results of our and other studies have shown that mental health of university students is significantly affected by COVID-19-related distress, especially in the early period of the pandemic with concurrent restrictive measures[19]. Also, our results are in line with the initiatives of cross-national research, which could address these issues and provide an improvement of the empirical basis for future psychological interventions and services for described entities in this risk population[5,11]. In subsequent research, emphasis should be placed on the aforementioned psychological processes because novel reactions can be expected after initial changes, due to the state of prolonged stress and accumulation of frustration, which has been prevalent in this young population for nearly a year.

It is important to emphasize that the study participants were medical students only, therefore, other studies should also be included in the assessment of risk factors for adverse mental health outcomes during the pandemic.

Adaptation to the global pandemic has been a significant challenge for the whole population, including university students, so that they have to adapt to novel methods of learning in a new setting, within a limited time period. The results of our study imply that certain factors influence the development of adverse mental health outcomes during this critical period, which ought to be seriously considered when planning psychological interventions and services. The COVID-19 pandemic has brought attention to educational gaps, creating an opportunity to make substantial changes, long term investments, innovations, and increased access to education in public health[22].

Limitations were a cross-sectional study design, and voluntary sample, which may have led to a selection bias. It is possible that the individuals who voluntarily took part in the study described their emotional state more easily and talked about their difficulties more openly. The participants attended only one university, and filled out an online, self-report questionnaire. However, the effect of a potential self-reporting bias could be compensated for by strictly anonymous participation. Previous psychological problems and family mental history details were not specified, which could be important to assess in future research. Similarly, detailed data on cigarette, alcohol, or psychoactive substance consumption were not considered.

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Sažetak

NEGATIVNI ISHODI MENTALNOG ZDRAVLJA KOD STUDENATA MEDICINE U SRBIJI TIJEKOM PANDEMIJE COVID-19

D. Ignjatović Ristić, D. Hinić, I. Ristić, P. Milanović, N. Milenković, D. Selaković i *G. Rosić*

Specifičnosti studentske populacije mogu predstavljati povećani rizik od negativnih ishoda mentalnog zdravlja tijekom pandemije COVID-19. Cilj studije je bio procijeniti percipiranu razinu stresa, anksioznosti i depresije kod studenata medicine tijekom državnog zaključavanja uzrokovanog epidemijom COVID-19 i odnos tih konstrukata s različitim sociodemografskim varijablama. Studija je provedena putem interneta od 20. do 29. travnja 2020. godine tijekom prvog državnog zaključavanja (pomoću sociodemografskog upitnika i ljestvice DASS-21) na uzorku od 420 studenata (žena 81,7%, M_{age}=22,53) na Sveučilištu u Kragujevcu. Većina sudionika (55% do 58%) nije imala simptome depresije, anksioznosti ili stresa, a srednje vrijednosti ovih zbirnih vrijednosti bile su između kategorija „bez simptoma" i „s blagim simptomima". Prediktori za javljanje simptoma depresije bili su prethodni psihološki problemi (omjer vjerojatnosti [OR]=3,16), obiteljska anamneza mentalnih bolesti (OR=2,12) i status veze (OR=0,61). Za simptome anksioznosti prediktori su bili ženski spol (OR=2,38), prijavljeni prethodni psihološki problemi (OR=3,91) i dob (OR=0,92). Prediktori simptoma stresa bili su ženski spol (OR=2,31), prethodni psihološki problemi (OR=3,18) i dob (OR=0,91). Rezultati istraživanja podrazumijevaju da određeni čimbenici utječu na razvoj nepovoljnih ishoda mentalnog zdravlja u ovom životnom razdoblju, što treba uzeti u obzir prilikom planiranja psiholoških intervencija i usluga.

Ključne riječi: *COVID-19; Studenti; Anksioznost; Depresija; Stres*