

PSYCHOLOGICAL EFFECTS OF “DOUBLE CRISIS” (COVID-19 PANDEMIC AND EARTHQUAKES) ON CROATIAN MEDICAL STUDENTS

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SUMMARY

Introduction: In 2020, the COVID-19 pandemic presented an additional source of stress and anxiety not just to the general population but also to medical students who are, even under normal circumstances, constantly under pressure due to demanding student duties. In addition, they experienced a series of devastating earthquakes in and around the Zagreb region which altogether could have had compromised their psychological well-being. The aim of this review was to evaluate the psychological effects of these two natural disasters on the mental health of Croatian medical students.

Results: According to standardized questionnaires for depression and anxiety evaluation, 75.3% of students were anxious and 65.2% were depressive during the “double crisis”. No significant difference of these two outcomes was observed regarding genders, but it was found that first year students had a significantly higher anxiety score than older ones.

Conclusion: In such stressful situations, we should emphasize the importance of mental health not just of healthcare workers, but also of medical students in order to prevent serious psychological consequences and to alleviate the negative effects on students' motivation and their educational process.

Key words: depression students - COVID-19 - earthquake

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INTRODUCTION

In March 2020, there was an outbreak of the novel coronavirus across European countries, including Croatia. Due to the seriousness of the infection and the lack of knowledge about the disease, the initial response included many strict epidemiological measures including “lock-down”, which dramatically changed our lives. Social distancing, fear, insecurity and an unpredictable future led to the development of many negative emotions such as anxiety, tension, depression and anger (Büssing et al. 2020, Shi et al. 2020). Generally, everyone was at a higher risk of anxiety and depression, but some specific groups such as healthcare workers and medical students were particularly affected due to the pressure caused by usual responsibilities, board exams, difficulties in lecture organization, fear of infection, self-isolation and additional work related to the participation in public health campaigns and epidemiologic projects (Theoret et al). In the same month, a 5.5 Richter earthquake devastated the capital city of Zagreb and the surrounding region. This was the strongest earthquake in the area since 1880, and it seriously damaged the educational facilities of the University of Zagreb, School of Medicine. It caused the subsequent transition of practically the entire curriculum and exams to a virtually-delivered format.

Therefore, the almost simultaneous occurrence of these two major tragedies, affected significantly the models of education and duties of medical students in Zagreb, but also it had impact on their psychological well-being which caused specific behavioral changes. The pandemic crisis continued over the entire year and more, smaller sets of earthquakes hit Zagreb and the surrounding area at the end of 2020. Another large earthquake, the most devastating that year at a magnitude of 6.4 on the Richter scale occurred at the city of Petrinja some 60 km away from the capital. It caused a number human victims and significant damage to buildings.

It was already observed in recent studies that the COVID-19 pandemic caused significant psychological distress and signs of mental illness in the adult general population, but psychological changes and motivation for studying among medical students was not sufficiently addressed (Shuja et al). The present article aimed to evaluate these psychological changes among medical students relevant to the COVID19 pandemic and earthquakes in Croatia. In addition, this research can provide support and reference for other institutions and governments to implement psychological interventions and support programs for medical students or medical staff during the COVID-19 pandemic.

SUBJECTS AND METHODS

Participants and measures

We conducted a cross-sectional anonymous study among medical students of all years of study at the Faculty of Medicine, Zagreb (University of Zagreb) in January 2021. The first part of the survey was developed to collect three basic student characteristics (sex, year of study and specialization preference).

The second part consisted of three online surveys: one customly designed questionnaire in order to explore students' motivation for study, attitudes toward educational changes and vaccination; and two validated surveys to evaluate symptoms of depression (*The Patient Health Questionnaire-9; PHQ-9*) and anxiety (*General Anxiety Disorder-7; GAD-7*). Depression Severity was defined as follows: 0-4 none, 5-9 mild, 10-14 moderate, 15-19 moderately severe, 20-27 severe. Similarly, in GAD-7 score, cut points of 5, 10, and 15 were interpreted as mild, moderate, and severe levels of anxiety.

The questionnaires were initially distributed by dedicated medical students (representatives of each class) via social networks, e-mail or mobile messaging services and the distribution was further continued followed by a snowball sampling approach. All participants were informed about the aim of the study, ethical issues and data collection. Questionnaires were prepared using Google Forms and were completely anonymous.

Means (M) and standard deviation (SD) were used to describe the demographic data. Student t test was used to compare means between different groups. P value <0.05 was considered statistically significant. For the analyses, we used the computerized statistical software SPSS 24.0 (IBM Corp).

RESULTS

Participant Characteristics

The questionnaire was sent to 300 students and a total of 280 students responded while 32 of the responses were invalid due to incomplete filling, therefore, the valid response rate was 82.6%. Among these 248 participants, there were 146 females and 102 males, with a median age of 22 years (range 18-29). As shown in Table 1, all 6 years of study were almost equally represented which maximally reduced selection bias.

Table 1. Baseline demographic data

Category	Total: 248
Gender, n (%)	
Female	146 (58.8)
Male	102 (41.2)
Age in years, mean ± SD (IQ range)	21.6±2.8 (19-27)
Study year n (%)	
1 st	43 (17.3)
2 nd	39 (15.7)
3 rd	46 (18.5)
4 th	41 (16.5)
5 th	40 (16.1)
6 th	39 (15.7)

SD = standard deviation; IQ = Interquartile range

Questionnaires results

The results of the custom-made questionnaires are presented in Figures 1-4 and here we specify the most important outcomes. Motivation for study was substantially decreased in 2020 since more than ¾ of the participants answered that it was lower when compared

In 2020, I felt more depressive or anxious than in 2019. If yes, do you think it is related to pandemic or earthquake?

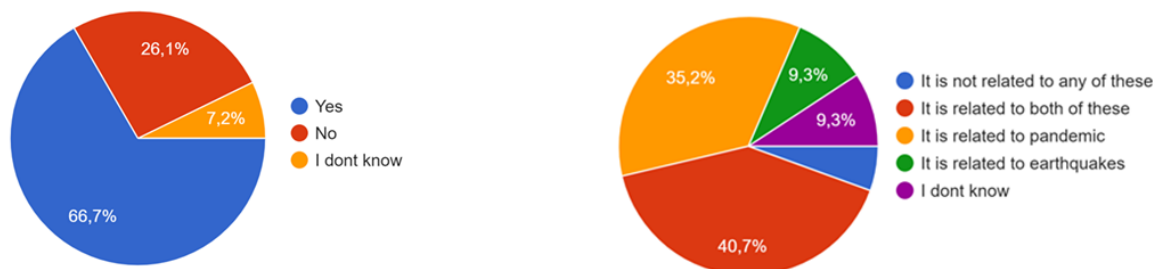


Figure 1. Prevalence of self-reported depression and its causes

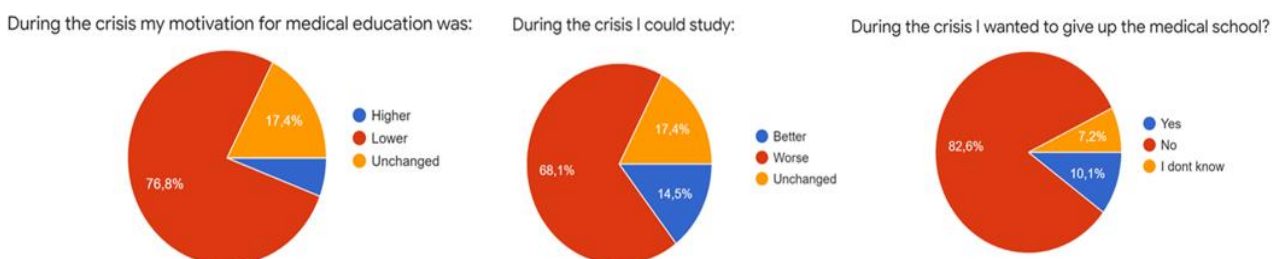


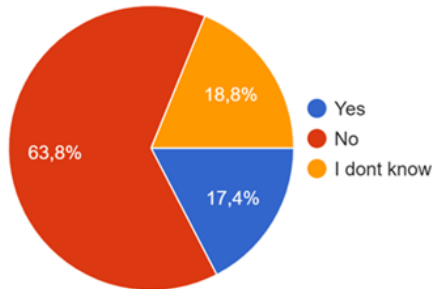
Figure 2. Study motivation during the crisis

This crisis will have negative impact on our future medical knowledge. I think that alternative education (online) is better than standard education.

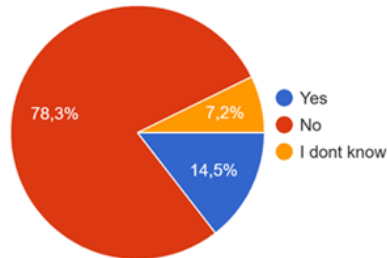


Figure 3. Attitudes towards education

During the crisis I have changed my specialization preference.



Before the pandemic I wanted to be epidemiologist/virologist/infectiologist or microbiologist?



Now, I want to be epidemiologist/virologist/infectiologist or microbiologist?

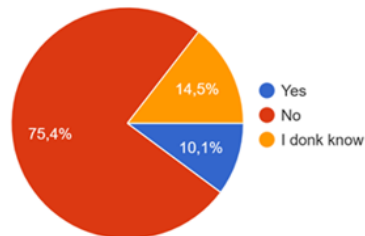


Figure 4. Specialization preference

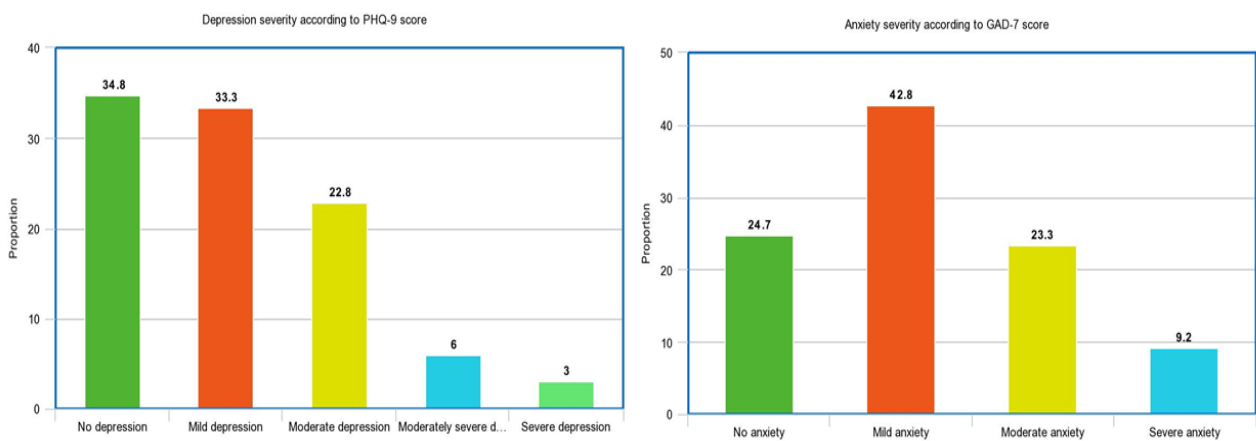


Figure 5. Depression (PHQ-9) and anxiety scores (GAD-7)

to previous years and almost 70% of them could studied worse than before. However, only 10% of them wanted to give up medical school at some point during 2020. The majority of participants considered alternative education methods to be inferior to the standard one, and almost 87% of them consider that this “double crisis” will have negative impact on their future medical knowledge. Around ¾ of respondents will (or did already) vaccinate.

Two thirds of respondents felt more depressive in 2020 than in 2019. Results were further evaluated using standardized questionnaire as described below.

Interestingly, the crisis did not largely affect specialization preference since only 16% of respondents changed the opinion regarding future specialization. In addition, according to the study results, the COVID-19 pandemic did not motivate students to seek specialties related to infectious diseases and we observed a negative trend toward these specializations since the vast proportion of students who wanted to be infectiologist/epidemiologist before and after the pandemic decreased from 15% to 10%.

The mean PHQ-9 score was 7.13 (SD: 5.2) and the mean GAD-7 score was 7.7 (SD: 4.84). There was a strong positive Pearson’s correlation between the PHQ-9 score and GAD-7 score with R coefficient of 0.82 (p-value < 0.001).

Regarding the presence of depression according to PHQ-9 score (Figure 5), only 34.8% of the participants scored <5 which indicates absence of depressive disorder. The prevalence rate for different depression severities was as follows: mild depression (PHQ-9 score 5–9) was present in 33.3%; moderate depression (PHQ-9 score 10–14) in 22.8%, moderately severe depression (PHQ-9 score 15–19) in 6%, and severe depression (PHQ-9 score 20–27) in 3% of the participants.

GAD-7 score showed that 32.5% of participants had high anxiety scores (GAD-7 scores ≥ 10). Different degrees of anxiety are presented in Figure 5.

As Table 2 demonstrates, the results showed no significant difference for both anxiety and depressions scores when sex was considered. Females had mean PGQ-9 score of 7.49 (SD = 5.43) and males had 7.06 (SD = 5.58) with p value of 0.5323. Similarly, for GAD-7 scores mean scores for females and males were 7.87 and 7.06, respectively (P=0.17). When different class years are compared, participants from the first class (mean 8.86, SD = 5.13), had significantly higher GAD-7 score when compared to other classes (6.91 SD = 4.40), P=0.02. In contrary, PHQ-9 scores were comparable across all classes.

DISCUSSION

There is an increasing number of studies showing that psychological stress is a common response to the COVID-19 pandemic, not just in the general population,

but also by college students as well (Gulzar et al 2020; Wu et al 2020). It may manifest with anxiety, fear, depression and decreased motivation for study. The impact of natural disasters and earthquakes is already well described, but a simultaneous occurrence of 2 major natural crises’ is extremely rare, thus, it is expected that due to compiling demands and pressures, medical students’ mental and physical well-being may be seriously compromised especially when compared to people who suffered a single crisis only (Farooqui et al 2020). Well known new circumstances (“new normal”) along with some specific changes related to medical education such as online lectures, absence of peer interactions and lack of direct patient care increased emotional stress among medical students (O’Byrne et al. 2020). Therefore, the aim of this study was to evaluate the psychological condition of medical university students during the pandemic and a series of earthquakes in the Zagreb area during 2020.

The high response rate indicates that there was a *strong interest of students* on this subject and that they wished to discuss the changes of their well-being during these times of uncertainty brought on by the recent natural events.

Despite expectations that medical students would widely approve vaccination policies, the fact that almost 25% of participants reject vaccination indicates that there is certain degree of vaccine hesitancy or mistrust, which is comparable to the attitude towards vaccination in the general population observed in the literature (Dror et al. 2020).

Interestingly, when students were asked to compare depression/anxiety levels in 2019 and 2020, 66.7% answered that they were more depressive in 2020. Almost the same result was achieved when the PHQ-9 questionnaire was evaluated which showed that only 34.8% of them were not depressive. It signifies that PHQ-9 is a useful and accurate tool for evaluating depression in students.

Table 2. Univariate analysis of impact of two factors (sex and study year) on outcomes

Category	Mean (SD) (248 cases)	p-value*
Depression score		0.53
Males	7.06 (5.58)	
Females	7.49 (5.43)	
Anxiety score		0.17
Males	7.21 (5.1)	
Females	7.87 (4.86)	
Depression score		0.28
Year 1	7.43 (5.67)	
Year 2-6	7.18 (4.92)	
Anxiety score		0.02
Year 1	8.86 (5.13)	
Year 2-6	(4.40)	

*Calculated using Student “t” test; SD = standard deviation

Even though several studies involving students showed differences in depression and anxiety levels between genders, this study did not confirm significant differences regarding this issue and it seems as if the COVID-19/earthquake crisis affected both genders equally (Özdin et al 2020; Shi et al 2020).

As this study shows, the majority of results should definitely *raise awareness of a high depression/anxiety prevalence among medical student during recent stressful periods, however, some encouraging findings were present in this study as well*. First, despite less motivation and less study efficiency, the great majority of students wish to continue their study and prefer the classic standard education over online-virtual lectures. Second, although, 2/3 of participants suffered from depression according to the PHQ-9 score, the majority of them had a score 5-9 which indicates mild (least intensive form) depression. Similar results are observed when GAD-7 score is evaluated. It suggests that students were greatly affected by the crisis, but also, they developed *coping mechanisms* which help them to navigate through these *stressful* times. Lastly, students were very cooperative and responded quickly. Through these results, they will realize that, during the crisis, psychological changes are not just an individual issue, but it is present in the majority of the student population. We hope that this will motivate students to seek psychological help when necessary.

Opinion of crisis impact on education

The results suggest that emotional and cognitive consequences of crises and changes of educational paradigm led to decreased motivation and study efficiency, at least when students evaluate their own experience. However, for objective evaluation of their medical knowledge we should compare the results of written exams stratified by subjects and analyze if grades are better or worse when compared to previous student generations. Since the crisis is still ongoing, we will have to wait for such results at least until the end of this academic year. It would be beneficial as well, to conduct similar questionnaire studies to lecturers in order to see their opinion on the quality of education during the crisis and students' knowledge.

Proposed intervention to ease adverse impact of crisis

Due to the described impact of COVID-19 pandemic and earthquakes on the psychological condition of medical students, specific interventions may be necessary to alleviate adverse effects of these disasters on their mental health and their medical education. First, we believe that Universities should provide additional psychological support for their students in order to treat anxiety and depression related to crisis situations. Students should be encouraged to seek help, particularly when serious signs of depression are present.

Furthermore, healthcare institutions and associated bodies should frequently analyze prevalent problems related to the mental health of medical and other students in order to do evaluate and respond on time.

Second, every effort should be made to simplify the transition from "live" to "online" education. It includes adequate digital education of both professors and students. Schools should provide digital support and digital educational materials for free, but also strive to organize at least some degree of standard education, for example, have smaller groups during lectures or clinical visits. Students should also be made aware of possible adverse effects of the continuous use of cell phones and computers on their stress level and anxiety. Therefore, involvement in extracurricular activities and sport should be emphasized. Despite social distancing, students should be encouraged to continuously interact with colleagues, friends and family members and share thoughts and discuss emotional problems with each other.

Third, although the events in 2020 required an additional mobilization of medical staff including students, healthcare leaders should have in mind that medical students are still not doctors and they should not be burdened with the responsibility of jobs and obligations related to the recovery from the pandemic or earthquake.

Regarding education, we believe that medical schools should follow their initial curriculum despite the importance of COVID-19 crisis. It means that, although the whole world is focused on COVID-19 crisis, including most media, medical schools should not allow the reduction of educational activities in other clinical fields. The medical students should be aware and supported that there will not be any decrease in the quality of education, for example losing a year. Furthermore, additional organizational support should be given such as extra exam deadlines or allowance to transfer additional exams (subjects) to the next year.

The medical school should monitor the students continuously even after the crisis, since it may take some time for social and psychological normalization to occur after the unexpected pause/delay in their education. It is important that a balanced psychological atmosphere is afforded to students and the whole academic community.

We believe that these measures and the joint effort of government authorities, healthcare institutions and academic institutions may mitigate negative impacts of "double crisis" on mental condition of medical students.

Limitations of the study

There are several limitations of this study. First, since the results were based on online distributed questionnaires, all outcomes were self-reported, however this is a common method for depression/anxiety evaluation although the diagnosis of depression is ultimately made by a clinician. Second, we did not collect data on preexisting mental co-morbidities which could have

confounding effects on main outcomes. Third, we did not collect depression and anxiety scores for the period before the crisis which precluded adequate comparisons of mental conditions in pre- and post- COVID-19 era. Lastly, potential self-selection bias might exist since questionnaires could have attracted students who were more concerned about their mental health.

CONCLUSION

Medical students in Zagreb were unexpectedly faced with two major events in 2020. The obligation of social distancing and earthquakes that seriously damaged the majority of Medical School facilities has led to a paralyzed standard medical education, moreover, both events substantially affected students' mental and emotional well-being. This study is a *first step in recognizing the current problem* and further actions should be undertaken in order to improve and protect the mental health of medical students during the crisis.

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Conflict of interest: None to declare.

Contribution of individual authors:

Ivan Romić contributed to the original idea and designed the study;

Hrvoje Silovski has written and prepared the manuscript, Marko Mance has done literature search;

Goran Pavlek collected data;

Igor Petrović did statistical analysis;

Josip Figl analyzed survey responses;

Dario Grbavac has done literature review;

Trpimir Moric, Renata Romić, Branko Bakula & Ante Vulić contributed to data collection, manuscript writing, submission and translation.

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