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## EMOTIONAL REACTIONS AND COPING STRATEGIES OF MEDICAL STUDENTS DURING THE COVID-19 PANDEMIC: AN ONLINE CROSS-SECTIONAL STUDY

**Mariya Prilutskaya**<sup>1</sup>, <https://orcid.org/0000-0002-9099-316X>

**Tokzhan Mendualieva**<sup>1</sup>, <https://orcid.org/0000-0003-1665-3332>

**Ornella Corazza**<sup>2,3</sup>, <https://orcid.org/0000-0001-7371-319X>

<sup>1</sup> Pavlodar Branch of Semey Medical University, Department of personalized medicine and pediatrics, Pavlodar, Republic of Kazakhstan;

<sup>2</sup> University of Hertfordshire, School of Life and Medical Science, Hatfield, United Kingdom;

<sup>3</sup> Sapienza University of Rome, Rome, Department of Medico-Surgical Sciences, Italy.

### Abstract

**Introduction:** The coronavirus infection (COVID-19) poses a concern for medical professionals. While attention has been given to front-line clinicians, very little is known about the impact of the pandemic on the health of medical students.

**Aim:** The study aims at assessment of emotional reactions and basic feelings in association with specific coping strategies among a sample of medical university students in Kazakhstan during the COVID-19.

**Material and methods:** A cross-sectional self-administered survey was undertaken in 279 students of Semey Medical University. Measurement tools included the visual-analog scales (VAS) for the evaluation of the basic emotions/feelings and coping behaviours and the Hospital Anxiety and Depression Scale to detect potential signs of depression and anxiety. Data comparisons were provided using the ANOVA and Kruskal-Wallis tests. Logistic regressions with odds ratio (OR) calculation were used to identify those demographic characteristics and coping activities that were related to depression and anxiety during the COVID-19 quarantine.

**Results:** Overall, 17.6% of the respondents had symptoms of anxiety and 30.0% experienced depression, while 3.6% reported intense fear, 5.7% anger, 9.3% boredom, and 5.7% disappointment. The mean of the anxiety score was significantly higher among undergraduate students ( $p=0.019$ ) and residents trainees ( $p=0.035$ ). While undergraduate students and interns were more likely to engage in physical activities ( $p=0.020$ ), write diaries ( $p=0.029$ ), and play videogames ( $p=0.008$ ), residents and postgraduate students engaged more with clinical activities as a coping mechanism to reduce stress ( $p=0.006$ ). The odds of having anxiety symptoms were 1.56 times higher for those who reported active blogging in social media during the lockdown. In contrast, self-education was inversely related to the presence of anxiety symptoms (OR = 0.73). For depressive symptoms, age (OR=0.88), focusing on self-education (OR=0.68) and television watching (OR=0.76) were the alleviating factors in the multivariate regression model. Individuals using alcohol were 1.65 times more likely to develop depression.

**Conclusions:** The study provides the first insights into the emotional reactions and the coping strategies adopted by Kazakhstani medical students during the COVID-19 quarantine. Findings will inform future preventative efforts to safeguard their health, especially during challenging times.

**Key words:** quarantine, COVID-19, depression, anxiety, coping.

### Резюме

## ЭМОЦИОНАЛЬНОЕ РЕАГИРОВАНИЕ И КОПИНГ-СТРАТЕГИИ СРЕДИ СТУДЕНТОВ-МЕДИКОВ ВО ВРЕМЯ ПАНДЕМИИ КОРОНАВИРУСНОЙ ИНФЕКЦИИ: ПОПЕРЕЧНОЕ ОНЛАЙН ИССЛЕДОВАНИЕ

**Мария В. Прилуцкая**<sup>1</sup>, <https://orcid.org/0000-0002-9099-316X>

**Токжан Т. Мендуалиева**<sup>1</sup>, <https://orcid.org/0000-0003-1665-3332>

**Орнелла Корацца**<sup>2,3</sup>, <https://orcid.org/0000-0001-7371-319X>

<sup>1</sup> Павлодарский филиал НАО «Медицинский университет Семей», Кафедра персонализированной медицины и педиатрии, Павлодар, Республика Казахстан;

<sup>2</sup> Университет Хартфордшира, Школа Жизни и Медицинских наук, Хатфилд, Великобритания;

<sup>3</sup> «Сапиенца» - Римский Университет, Департамент медико-хирургических наук, Рим, Италия.

**Введение:** Коронавирусная инфекция (COVID-19) является поводом для значительной озабоченности среди медицинской общественности. В то время, как большая часть внимания уделяется клиницистам, работающим на передовой эпидемии, очень ограниченные данные доступны о влиянии пандемии на здоровье студентов-медиков.

**Цель:** Данное исследование направлено на оценку эмоциональных реакций и базовых чувств в ассоциации с определенными копинг-стратегиями среди выборки студентов медицинского университета Казахстана в условиях социальных ограничений по COVID-19.

**Материалы и методы:** Поперечный опрос был проведен среди 279 студентов НАО «Медицинский университет Семей». Оценочные инструменты включали в себя визуально-аналоговые шкалы для измерения базовых эмоций/чувств и копинговых действий, а также Госпитальную Шкалу оценки тревоги и депрессии. Сравнение данных проведено с помощью однофакторного дисперсионного анализа и теста Крускала-Уоллиса. Логистическая регрессия с расчетом отношения шансов (ОШ) использована для определения демографических характеристик и копингов, которые были связаны с депрессией и тревогой в условиях карантина по COVID-19

**Результаты:** В общем, 17,6% респондентов имели тревожные симптомы, 30,0% переживали депрессию, 3,6% сообщали о значительном страхе, 5,7% - о гневе, 9,3% - о скуке, 5,7% - о разочаровании. Средний уровень баллов по шкале депрессии был значительно выше среди студентов-бакалавров ( $p=0,019$ ) и резидентов ( $p=0,035$ ). Студенты программ бакалавриата и интерны чаще сообщали, что занимаются спортом ( $p=0,020$ ), ведут дневники ( $p=0,029$ ), играют в видеоигры ( $p=0,008$ ), чтобы справиться со стрессом. В то же время учащиеся резидентуры, магистратуры и докторантуры справлялись со стрессом, сосредоточившись на клинической деятельности ( $p=0,006$ ). Шансы обнаружения тревожных расстройств были в 1,56 раз выше среди тех учащихся, кто активно занимался написанием онлайн блогов. Напротив, самообразование демонстрировало обратную связь с симптомам тревоги (ОШ=0,73). Для депрессии, возраст (ОШ=0,88), сосредоточенность на самообразовании (ОШ=0,68) и просмотр телевизионных передач и фильмов (ОШ=0,76) были факторами защиты в регрессионной модели. Шанс развития депрессии при употреблении алкоголя возрастал в 1,65 раз.

**Выводы:** Данное исследование способствует первичному пониманию в отношении эмоционального реагирования и копинг-стратегий среди казахстанских студентов-медиков в условиях COVID-19. Находки исследования могут быть использованы для обоснования превентивных усилий для защиты здоровья учащихся, особенно в условиях значительных вызовов.

**Ключевые слова:** карантин, COVID-19, депрессия, тревога, копинг.

Түйіндеме

## **КОРОНАВИРУСТЫҚ ИНФЕКЦИЯ ПАНДЕМИЯСЫ КЕЗІНДЕГІ МЕДИЦИНА СТУДЕНТТЕР АРАСЫНДАҒЫ ЭМОЦИОНАЛДЫ РЕАКЦИЯСЫ МЕН КҮРЕСУ СТРАТЕГИЯСЫ: КӨЛДЕНЕҢ ОНЛАЙН ЗЕРТТЕУ**

**Мария В. Прилуцкая**<sup>1</sup>, <https://orcid.org/0000-0002-9099-316X>

**Тоқжан Т. Мендуалиева**<sup>1</sup>, <https://orcid.org/0000-0003-1665-3332>

**Орнелла Корацца**<sup>2,3</sup>, <https://orcid.org/0000-0001-7371-319X>

<sup>1</sup> «Семей медицина университеті» КеАҚ ПФ, Дербестендірілген медицина және педиатрия кафедрасы, Павлодар, Қазақстан Республикасы;

<sup>2</sup> Хартфордшир университеті, Өмір және медициналық ғылымдар мектебі, Хатфилд, Великобритания;

<sup>3</sup> «Сапиенца» - Рим университеті, Медициналық және хирургиялық ғылымдар департаменті, Рим, Италия.

**Кіріспе:** Коронавирустық инфекция (COVID-19) медицина қоғамы арасында айтарлықтай алаңдаушылық тудырады. Алдыңғы қатарлы эпидемияда жұмыс істейтін клиницистерге көп көңіл бөлінсе де, медицина студенттерінің денсаулығына пандемияның тигізер әсері туралы деректер өте шектеулі.

**Мақсаты:** Бұл зерттеу COVID-19 әлеуметтік шектеулер жағдайында Қазақстан Медицина университетінің студенттері арасындағы белгілі күрес стратегиясымен байланысты эмоционалды реакциялар мен базалық сезімдерді бағалауға бағытталған.

**Материалдар мен әдістер:** Көлденең сауалнама «Семей медицина университеті» КеАҚ 279 студенті арасында өткізілді. Бағалау құралдарына базалық эмоциялар/сезімдерді өлшеуге арналған визуальды-аналогтық шкалалар, сонымен қатар мазасыздық пен депрессияны бағалаудың Госпитальдық шкаласы кірді. Деректерді салыстыру бір факторлы дисперсиялық талдау және Краскал-Уоллис тестісі арқылы жүргізілді. Covid-19 бойынша карантин жағдайындағы депрессия мен мазасыздыққа байланысты демографиялық сипаттамалар мен копингтерін анықтау үшін мүмкіндік қатынасы (МҚ) есептеу арқылы логистикалық регрессия қолданылды.

**Нәтижесі:** Жалпы, респонденттердің 17,6%-ында мазасыздық белгілері болған және 30,0%-ы депрессияны бастан кешкен, 3,6%-ы қорқыныш туралы, 5,7%-ы - ашу туралы, 9,3%-ы-зәрігу туралы, және 5,7%-ы - түңілу туралы хабарлады. Депрессия шкаласы бойынша орташа балл бакалавриат студенттері ( $p=0,019$ ) мен резиденттер арасында айтарлықтай жоғары болды ( $p=0,035$ ). Бакалавриат бағдарламасының студенттері мен интерндер

стрессті жеңу үшін спортпен шұғылданатынын ( $p=0,020$ ), күнделік жүргізетінін ( $p=0,029$ ), бейне ойындар ( $p=0,008$ ) ойнайтындары туралы жиі айтты. Сонымен қатар резидентура, магистратура және докторантурада оқитындар клиникалық қызметке ( $p=0,006$ ) шому арқылы стрессті көтерген. Мазасыздықты анықтау мүмкіндігі белсенді онлайн блогтар жазумен айналысатын оқушылар арасында 1,56 есе жоғары болды. Керісінше, өздігінен білім алу мазасыздық симптомдарымен кері байланысты көрсетті ( $MҚ=0,73$ ). Депрессия үшін, жасы ( $MҚ=0,88$ ), өздігінен білім алуға шоғырлану ( $MҚ=0,68$ ) және телевизиялық хабарлар мен фильмдерді көру ( $MҚ=0,76$ ) регрессиялық модельде қорғау факторлары болды. Алкогольді тұтыну кезінде депрессияны дамыту мүмкіндігі 1,65 есе өсті.

**Қорытынды:** Бұл зерттеу COVID-19 жағдайындағы қазақстандық медицина студенттерінің арасындағы эмоционалды реакциясы мен күресу стратегиясы туралы алғашқы түсінікті дамытуға ықпал етеді. Зерттеу нәтижелері оқушылардың денсаулығын сақтау үшін алдын-алу әрекеттерін негіздеуге пайдалануға болады.

**Түйінді сөздер:** карантин, COVID-19, депрессия, мазасыздық, копинг.

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#### Introduction

The coronavirus pandemic poses an unprecedented challenge for the global community. A high speed of the infection spread and a dramatic growth in the number of fatalities cases caused by the coronavirus infection (COVID-19) indicate the gigantic burden for the public health, economy and social life [35]. The strict lockdown regimes generated an unprecedented emergency situation, especially for medical professionals, who made sustained efforts to contain the pandemic and adapt treatment standards for the new COVID-19 outbreak, while exposing themselves to virus exposure and contamination [23]. In accordance with the recommendations of the 'Centers for Disease Control and Prevention' (CDC) in the United States, any precautions involving medical staff should be implemented proactively in order to avoid contagion risks also for other staff and patients [7]. The constant update of clinical guidances during the COVID-19 period reflects the colossal work undertaken by international experts and research staff to introduce new effective and efficient standards for COVID-19 associated medical conditions [25, 31]. For example, the World Health Organisation (WHO) (WHO), the CDC, the National Institute of Health, the European Respiratory Society among many other health organisations have promptly released exhaustive set of clinical recommendations and other useful online resources [11, 24, 34]. In Kazakhstan, COVID-19 protocols have been updated ten times since the start of the outbreak in March 2020 [3]. The underlying principle for every medical expert in the country during COVID-19 is the following: the more evidence-based approaches will be introduced and established in the practice, the more intensive the informational flow will be [5, 17, 20]. However, the large

amount of clinical guidances and information made available during the pandemic has been accompanied by a myriad of public news and sometimes contradictory and unreliable messages released by the media that pose additional pressure to medical professionals who are under constant public scrutiny [10].

Such a phenomenon affects different clusters of expertise: from medical students to researchers [29]. The first reports on the drastic impact of pandemic challenges on both stress perception and anxiety among medical students were published since April 2020 [2, 6]. Cao et al. for instance pointed out that having relatives or acquaintances infected with COVID-19 was a risk factor of increased anxiety in medical college students, especially if living in urban areas, while family income stability and living with parents were protective factors against anxiety. Authors concluded that the mental health of college students should be monitored during epidemics as this social group represents an instrumental human capital for the stable development of medicine and public health practice [6]. In Kazakhstan, pandemic precautions entailed the migration of clinical activities to remote theoretical programmes in mid March of 2020. The preliminary results of the first attempt to assess the stress perception in medical students demonstrated the substantial rate of depression and anxiety in the medical university community [2].

In order to address such a knowledge gap, this study aims at assess emotional reactions and basic feelings in association with specific coping strategies among medical university students in Kazakhstan during the COVID-19 pandemic. The objectives were: (a) to compare the emotional reactions and coping strategies of different

educational groups; (b) to investigate the relation between the particular coping strategies and depression/anxiety symptoms.

**Methods**

The study was conducted at Semey Medical University, which consists of three administrative units: a central campus and two branches (in Pavlodar and Oskemen). The study subjects were the students of all of three units who enrolled into an online survey, upon receiving informed consent. The cross-sectional self-administered survey was developed with the Google Form programme and included five domains regarding socio-demographic characteristics, lockdown conditions, perception of psychological stress, depressive and anxious symptoms and coping strategies practiced during the quarantine. A cover letter with the study information was disseminated via student online networks (e.g. mailinglists, fora). The sampling followed a "snow ball" procedure by multiple reposting of the cover letter and the bilingual Kazakh and Russian survey link through WhatsApp and Telegram channels. Given that the odds ratio (OR) derived from binary logistic regression was a primary objective of the study, the target sample size was calculated on the basis of our own pilot data according to the proportion of those involved in a self-care coping strategy (e.g. self-education among the students based at the Pavlodar Branch of SMU) [2]. For this aim we used an online calculator designed by the Centre for Clinical Research and Biostatistics [8]. The minimal sample size was calculated at the level of 269 subjects (Figure 1). The survey was open between 23 and 30 April 2020.

**Hypothesis: Two-Sided Equality for binary covariate**

$$H_0: \beta_1 = 0 \text{ versus } H_1: \beta_1 = \beta^* \neq 0$$

$$\log\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 x_1$$

Data Input: (Help) (Example)

Input		Results	
$\alpha$	0.05	Calculate	
$\beta$	0.1	Обработка	
$P_1$	0.60		N 269
$P_2$	0.32		
B	0.16		

Note:

Variables	Descriptions
$\alpha$	Probability of type I error
$\beta$	Probability of type II error
$P_1$	Event rate at X = 0
$P_2$	Event rate at X = 1
B	Proportion of the sample with X = 1
N	Sample size

**Figure 1. Sample size calculation.**

The measurement tools in the survey forms included multiple-choice questions and visual-analog scales (VASs). For the assessment of depression and anxiety symptoms the Hospital Anxiety and Depression Scale (HADS) was used. The HADS provided screening detection of affective symptoms at clinical or subclinical level. The core emotions and basic feelings were also measured with VAS from "0" to "5". Additionally, all the respondents were asked about the personal relevance of particular ways of overcoming stress

during the quarantine, including both positive/adaptive and negative/disadaptive behavioral coping strategies, using a five-point VAS.

*Statistical analysis*

Statistical analysis was based on descriptive, comparative and inferential statistical methods. Descriptive data were presented as frequency in absolute numbers (n) and percentages for categorical variables (%), as well as mean (M) and standard deviation (SD) for numerical variables with normal distribution. Those numeric variables that did not have normal distribution were described with medians (Me) and interquartile ranges [IQR]. For numerical variables, data comparisons were provided with the ANOVA and Kruskal-Wallis tests (H), accompanied by posterior paired comparisons with Bonferroni corrections. The level of significance was set at p-value (p) < 0.05. Bivariate and multivariate logistic regressions were used to detect those demographic characteristics and coping activities that were related to the depression and anxiety during the COVID-19 quarantine. All analytical procedures were performed with the Statistical Package for the Social Sciences (Version 20.0, SPSS Inc., Chicago, IL, USA).

*Ethical considerations*

The protocol of the study was approved by the Local Ethics Committee of Semey Medical University (23.04.2020, No.9).

**Results**

Among the 279 respondents, 209 (74.9%) were females. The mean age of males was 24.61 ± 0.49 year and that of females was 23.82 ± 0.21 year. A substantial majority were Kazakh - 242 students (86.7%). The distribution of the sample by the study programs was as follows: undergraduates, 29.7% (n=83); interns, 48.8% (n=136); residents, 18.3% (n=51); students of master programs, 2.5% (n=7); and two PhD students. Over the period of the quarantine, 224 respondents (80.3%) lived in the cities, 55 students (19.7%) resided in rural areas. Over a half of the respondents (n=143) lived with parents or relatives. Married respondents (n=88) lived with their partners, in some cases in the form of extended families in one household (n=14). Only 17.2% of the respondents shared flats with their friends or lived on their own. Overall, 211 respondents (75.6%) suspended clinical practice at hospitals due to the quarantine restrictions. The other respondents continued working in clinics as trainees (10.8%) or as paramedics (13.6%) in parallel with their studies. Of all the respondents staying indoors for more than 12 hours a day (82.1%), 69 respondents (24.7%) reported spending their entire days under the lockdown.

The characteristics of emotional reactions at the time of the lockdown indicated that up to 17.6% of the respondents had symptoms of anxiety and 30% experienced depression, while 3.6% reported intense fear, 5.7% anger, 9.3% boredom, and 5.7% disappointment. In contrast, more students experienced positive emotions and feelings: compassion, 8.2%; cheerfulness, 10%; hope, 17.6%.

Table 1 displays results of HADS and VAS for the entire sample and compares them between different educational groups.

Table 1.

**Characteristics of emotional state and reactions, by educational group.**

Parameters	Total (n=279)	Undergraduates (n=83)	Interns (n=136)	Residents (n=51)	Master and PhD students (n=9)	<i>p</i>
<b>HADS score</b>	<b>M±SD</b>	<b>M±SD</b>	<b>M±SD</b>	<b>M±SD</b>	<b>M±SD</b>	<b>ANOVA</b>
Depression	5.45±0.22	5.89±0.42	5.17±0.27	5.45±0.58	5.67±1.08	0.581
Anxiety	4.49±0.22	5.21±0.43	3.65±0.30	5.29±0.51	5.89±0.77	<b>0.003</b>
<b>VAS score</b>	<b>Me [IQR]</b>	<b>Me [IQR]</b>	<b>Me [IQR]</b>	<b>Me [IQR]</b>	<b>Me [IQR]</b>	<b>H-test</b>
Sadness	1.0 [0, 2.0]	1.0 [0, 3.0]	0 [0, 2.0]	1.0 [0, 2.0]	2.0 [0, 3.0]	0.080
Discouragement	1.0 [0, 2.0]	1.0 [0, 3.0]	0 [0, 2.0]	1.0 [0, 2.0]	2.0 [0, 3.0]	0.184
Fear	1.0 [0, 2.0]	1.0 [0, 3.0]	0.5 [0, 2.0]	1.0 [0, 3.0]	2.0 [1.0, 2.5]	<b>0.026</b>
Anger	0 [0, 2.0]	1.0 [0, 2.0]	0 [0, 1.0]	1.0 [0, 2.0]	1.0 [0, 3.0]	<b>0.012</b>
Disappointment	1.0 [0, 2.0]	1.0 [0, 3.0]	0 [0, 2.0]	0 [0, 2.0]	2.0 [1.0, 2.0]	0.140
Loneliness	0 [0, 1.0]	0 [0, 2.0]	0 [0, 1.0]	0 [0, 1.0]	0 [0, 3.0]	0.638
Hopelessness	0 [0, 2.0]	1.0 [0, 2.0]	0 [0, 1.0]	0 [0, 2.0]	1.0 [0, 3.0]	0.196
Despair	0 [0, 1.0]	0 [0, 2.0]	0 [0, 1.0]	0 [0, 1.0]	0 [0, 3.5]	0.173
Apathy	0 [0, 1.0]	0 [0, 2.0]	0 [0, 1.0]	0 [0, 2.0]	1.0 [0, 3.0]	0.494
Boredom	1.0 [0, 2.0]	2.0 [0, 4.0]	1.0 [0, 2.0]	0 [0, 2.0]	0 [0, 1.5]	<b>0.005</b>
Compassion	1.0 [0, 3.0]	1.0 [0, 3.0]	1.0 [0, 3.0]	1.0 [0, 3.0]	2.0 [1.0, 2.5]	0.608
Cheerfulness	2.0 [1.0, 3.0]	2.0 [1.0, 4.0]	2.0 [1.0, 3.5]	2.0 [1.0, 3.0]	3.0 [1.0, 3.5]	0.931
Hope	3.0 [1.0, 4.0]	3.0 [1.0, 4.0]	3.0 [1.0, 4.0]	2.0 [1.0, 3.0]	2.0 [1.0, 3.0]	0.254

HADS - the Hospital Anxiety and Depression Scale;

VAS - visual analogue scale;

Statistics are P values for ANOVA/Kruskal-Wallis test (H);

M – mean; SD - standard deviation; Me – median; IQR - interquartile range.

The mean of the HADS score of depressive symptoms did not differ among the educational groups, while the mean of the anxiety score was significantly higher in the undergraduates ( $p=0.019$ ) and the residents ( $p=0.035$ ). Intense fear and anger were more likely to be expressed by the undergraduates and residents in comparison to the other groups. Moreover, while being under the lockdown, the youngest students felt boredom substantially more frequently than the others did.

Survey respondents were also asked to rate the effectiveness of the various activities at coping with the quarantine-related stress. The results of the comparisons of the median VAS scores among the educational groups are presented in Table 2. The undergraduates and interns were more likely to do sport exercises, write diaries, and play videogames, while the residents and master/PhD students coped with the stress through clinical activity.

Table 2.

**Stress coping activities, by educational group.**

Activities	Total (n=279)	Undergraduates (n=83)	Interns (n=136)	Residents (n=51)	Master and PhD students (n=9)	<i>p</i>
	Me [IQR]	Me [IQR]	Me [IQR]	Me [IQR]	Me [IQR]	H-test
Book reading	3 [1, 5]	3 [1, 5]	3 [1, 4]	3 [0, 4]	2 [1, 3.5]	0.442
Self-education	3 [1, 5]	3 [1, 5]	3 [2, 4]	2 [1, 5]	3 [1.5, 4.5]	0.663
Personal-growth activities	2 [1, 4]	3 [1, 4]	2 [1, 4]	2 [1, 3]	2 [1, 4]	0.163
Internet surfing	3 [1, 5]	3 [1, 5]	3 [1, 4]	3 [1, 5]	3 [2, 4.5]	0.966
Blog writing	0 [0, 2]	1 [0, 2]	0 [0, 2]	0 [0, 1]	1 [0, 2.5]	0.318
Listening to music	3 [1, 5]	3 [1, 5]	4 [2, 5]	3 [0, 5]	2 [1, 3.5]	0.109
Fitness and sport	3 [1, 5]	3 [1, 5]	3 [1, 5]	2 [0, 4]	2 [1.5, 3.5]	<b>0.020</b>
Live communications	3 [1, 5]	4 [1, 5]	4 [2, 5]	3 [1, 5]	3 [1.5, 5]	0.263
Online communications	4 [2, 5]	4 [2, 5]	4 [2, 5]	3 [1, 5]	3 [1.5, 4.5]	0.584
Clinical practice	2 [0, 4]	1 [0, 3]	2 [0, 3]	3 [1, 4]	2 [0, 4.5]	<b>0.006</b>
Focusing on hobby	3 [1, 5]	4 [1, 5]	3 [1, 5]	3 [1, 4]	4 [1.5, 5]	0.433
Diary writing	0 [0, 2]	1 [0, 3]	1 [0, 2]	0 [0, 1]	0 [0, 1.5]	<b>0.029</b>
Alcohol and energy drinks use	0 [0, 0]	0 [0, 0]	0 [0, 1]	0 [0, 0]	0 [0, 3.5]	0.143
Food cooking and tasting	2 [1, 5]	2 [1, 5]	2.5 [1, 5]	3 [0, 4]	2 [1, 4.5]	0.651
Gaming	0 [0, 2]	1 [0, 3]	0 [0, 2]	0 [0, 0]	0 [0, 2.5]	<b>0.008</b>
TV watching	3 [2, 5]	4 [2, 5]	4 [1.25, 5]	3 [1, 5]	2 [1.5, 4.5]	0.520

Me – median,

IQR - interquartile range,

p – value for Kruskal-Wallis tests (H)

We calculated the strength of the relationships between demographic characteristics, coping activities and depression and anxiety symptoms (Table 3). Within the multivariate models, the odds of having anxiety symptoms were 1.56 times higher for those who reported active blog writing in social networks during the lockdown. In contrast,

self-education was inversely related to the presence of anxiety symptoms. For depressive symptoms, age, focusing on self-education and TV watching were the alleviating factors in the multivariate regression model. Notably, the use of alcohol and energy drinks to overcome stress resulted in 1.65-fold increase in the odds of depression.

Table 3.

**Associations between depression, anxiety, demographics and coping activities.**

Parameters	Anxiety symptoms				Depressive symptoms			
	OR	95%CI	AOR	95%CI	OR	95%CI	AOR	95%CI
Age	0.99	0.90; 1.09	0.97	0.87; 1.08	0.94	0.85; 1.04	<b>0.88</b>	<b>0.78; 0.98</b>
Gender (male /female)	1.20	0.58; 2.50	1.60	0.66; 3.87	0.94	0.51; 0.71	1.44	0.66; 3.16
Self-education	<b>0.77</b>	<b>0.64; 0.93</b>	<b>0.73</b>	<b>0.57; 0.94</b>	<b>0.74</b>	<b>0.63; 0.87</b>	<b>0.68</b>	<b>0.56; 0.85</b>
Internet surfing	0.87	0.72; 1.05	1.03	0.75; 1.41	0.97	0.83; 1.13	1.43	1.09; 1.87
Blog writing	<b>1.25</b>	<b>1.04; 1.51</b>	<b>1.56</b>	<b>1.21; 2.02</b>	1.05	0.88; 1.25	1.03	0.82; 1.29
Online communications	<b>0.79</b>	<b>0.66; 0.95</b>	0.80	0.59; 1.08	<b>0.81</b>	<b>0.69; 0.94</b>	0.87	0.67; 1.11
Clinical practice	0.91	0.76; 1.08	0.97	0.76; 1.24	0.90	0.77; 1.05	0.96	0.78;1.18
Alcohol and energy drinks use	1.19	0.93; 1.53	1.15	0.84; 1.56	1.43	1.14; 1.79	<b>1.65</b>	<b>1.22; 2.23</b>
Gaming	1.94	0.77; 1.12	0.95	0.73; 1.24	0.99	0.85; 1.15	0.95	0.75; 1.20
TV watching	<b>0.81</b>	<b>0.68; 0.97</b>	0.94	0.71; 1.25	<b>0.81</b>	<b>0.70; 0.95</b>	<b>0.76</b>	<b>0.59; 0.97</b>

OR – odds ratio,

AOR - adjusted odds ratio,

95% CI - 95% confidence interval.

**Discussion**

To the best of our knowledge, this study provides the first investigation on the emotional reactions of medical students in Kazakhstan and provides novel insights on the role played by coping strategies to mitigate the affective symptoms during the COVID-19 quarantine restrictions.

The results of the study revealed a high prevalence of depression (30%) and anxiety (17.6%) among the medical students from SMU. The comparison of the depression and anxiety symptoms according to the HADS scores demonstrated that interns experienced less intense anxiety. Depressive symptoms did not significantly differ among the educational groups. Similarly, the self-assessment of the particular negative and positive emotions/feelings revealed the presence of at least one intense emotion in up to one fifth of the respondents. The undergraduate students rated more frequently their fear and boredom as strong. We were able to uncover the higher prevalence of active coping strategies focusing on self-development (self-education, personal growth, sport, book reading), and social-contact support (online and face-to-face communications). These various coping strategies were more prevalent among the undergraduates and the interns, while the postgraduates considered their clinical practice as an effective aid in overcoming COVID-19 stress. Even though avoidant coping mechanisms (alcohol use and gaming) were not at high prevalence among the respondents, drinking behavior revealed significantly higher odds of depressive symptoms. Likewise, active blog writing was found to be a risk factor for anxiety symptoms. Based on our previous findings, we supposed that blogging might be connected to greater exposure to informational bombardment from various sources, including those spreading unreliable intimidating

data [2], as also highlighted in a recent consensus guidance on the problematic use of the Internet during the COVID-19 pandemic [19]. Alcohol use as avoidant coping, associated with an increased risk of depressive symptoms, was exhaustively discussed in a number of publications [14, 15, 27], including those forecasting repercussions of the COVID-19 social distancing [9, 21, 28].

Previous studies, undertaken before the emergence of COVID-19, found that medical students experienced depression and anxiety at a higher rate than the general population or students from other specialties [1, 13, 22, 26]. In this sense, the active coping strategies play a key role for stress management in terms of adjusting to the challenges of theoretical and practical education, to financial constraints [12]. Our findings about positive and negative coping strategies' relation to depression and anxiety correspond with the literature data on the importance of variety of the strategies practiced and intensity of their use [16]. Meanwhile, the COVID-19 pandemic, posing unprecedented psychological pressure, has been associated with changes in the coping repertoire. According to Umucu and Lee (2020), the COVID-19 stress in general population was positively associated with the following coping strategies: self-distraction, denial, substance use, behavioral disengagement [32]. In contrast, our findings revealed higher prevalence of positive coping activities and emotions/feelings (hope, cheerfulness, compassion) in medical students. The literature analysis shows that all internationally recommended coping strategies for COVID-19 stress are actively practiced by the respondents focusing on physical activities, self-development, and education [18].

Another point of our attention is the difference in experiencing particular emotions and feelings in specific

educational groups. To the best of our knowledge, there are no published data on the exact emotional features among undergraduate, graduate and postgraduate medical students in light of the COVID-19 precautionary measures. Our results, including prevalent fear, boredom and anxiety in the undergraduates, along with an adverse link between the age and the depression HADS score, demonstrated important implications for the future development of tailored mental-health prevention measures, especially for those of younger age. This predominance might account for the poorer emotional intelligence of first-years medical students [30], their stronger need for interactive educational approaches, with focusing not only on cognitive, but also on behavioral and emotional competencies [4]. It also could be connected with a more critical role of live peer contacts for younger students [33], which were restricted to a certain extent under the lockdown.

The study findings should be considered in light of some limitations. First, the participants were recruited through the limited number of social chats available to the research team from the Pavlodar branch of SMU. By using non-probabilistic sampling, the study findings on prevalence should be generalized with cautions. Meanwhile, a number of studies conducted in other medical universities revealed similar levels of depression and anxiety [6, 14]. Secondly, we were unable to examine the actual change of the students' emotional states during the COVID-19 due to shortcomings of the cross-sectional design. However, the survey's focus on a two-week period of the lockdown allowed us to capture the actual emotions and feelings under the lockdown. Third, the sample size limited the number of factors tested in the regression models and minimized the model fitness. Despite this limitation, we were able to detect several predictive variables in the model, and differentiate their roles as alleviating or deteriorating factors with respect to negative emotions during the COVID-19 lockdown.

Undertaking the pilot assessment of the emotional reactions to the pandemic precautionary measures, our study offered novel insights into mental health risks and threats during COVID-19. This is the first study of its kind to consider the emotional adaptation to the lockdown conditions in Kazakhstani youth in general and in medical students in particular. The present findings warrant future efforts to develop mental health preventive recommendations especially for students with anxiety and depressive reactions and negative (avoidant) coping strategies.

### Conclusions

1. The present study reported that up to a third of medical students of SMU experienced depression, which is consistent with international statistics in similar population groups. While the respondents with anxiety comprised a lower proportion (17.6%) of the sample, anxiety intensity varied with each educational group.

2. The complexity of affective reactions during COVID-19 was embodied in a wide spectrum of positive and negative emotions that varied between different educational groups and accompanied depression and anxiety.

3. Positive coping activities focusing on self-education, self-development, social support and physical activities

were popular among medical students released from clinical practice and exposed to distance education. Activities at public health settings were the other key coping mechanism that maintained its high relevance for the postgraduates (residents, master and PhD students) during the COVID-19 quarantine.

4. Avoidant coping methods, which were proven to be exacerbating factors for stress management, were found to have an aggravating effect on depression (alcohol use) and anxiety (blog writing) in the student sample, by raising their risks 1.65 and 1.56 times respectively.

### Authors contribution:

*Mariya Prilutskaya* – chief author, statistical analysis, manuscript writing;

*Tokzhan Mendualieva* – respondents enrollment, material processing;

*Ornella Corazza* – scientific advice, manuscript preparation.

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The authors have no conflict interest to declare.

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**Corresponding author:**

**Mariya Prilutskaya** – assistant, Department of personalized medicine and pediatrics, Pavlodar Branch of Semey Medical University, Pavlodar c., Republic of Kazakhstan.

**Mailing Address:** Republic of Kazakhstan, 140002, Pavlodar, Torajghyrov 72/1.

**Phone:** +77014186539

**Email:** mariyapril2407@gmail.com