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Research Note

Emotions and mood swings of pharmacy students in the context of the coronavirus disease of 2019 pandemic

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Introduction: The coronavirus disease of 2019 pandemic has changed university routines affecting student mental health. The aims of this study were to survey aspects related to mental health of pharmaceutical course students considering previous and current contexts.

Methods: The Depression, Anxiety, and Stress Scale (DASS-21), Impact of Event Scale-Revised, and Brunel Mood Scale were used. DASS-21 was completed pre- and post-pandemic. The validity and reliability of the data were verified. The prevalence (95% CI) of mental health symptoms was estimated. The relationship between the time spent watching/reading the news and mean scales scores was evaluated (Pearson’s correlation coefficient).

Results: The prevalence of depression symptoms in students pre-pandemic was 66.7% (95% CI = 65.3–68.1) and during the pandemic was 81% (95% CI = 79.8–82.2). More than 70% (95% CI = 69.8–72.6) of participants had some psychological impact as a result of the pandemic (mild: 16.7% [95% CI = 15.6–17.8]; moderate: 9.1% [95% CI = 8.2–10]; severe: 45.4% [95% CI = 43.9–46.9]). High values of tension, depressed mood, mental confusion, and anger were observed. There was a significant correlation between the time spent following the news of the pandemic and symptoms of anxiety (r = 0.356; P < .001), stress (r = 0.248; P = .014), hyperarousal (r = 0.322; P ≤ 0.001), and intrusion (r = 0.21; P = .039).

Conclusions: Students are highly vulnerable to depressive symptoms and mood swings due to the pandemic. These findings deserve consideration mainly from mental health professionals, but also from managers and educators.

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Keywords: Anxiety, Depression, Psychological stress, Mood, Pandemic

ABSTRACT

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Introduction

On 11 March 2020, the World Health Organization (WHO) characterized the new coronavirus disease of 2019 (COVID-19) as a pandemic. At the end of the month, as the number of people infected with coronavirus in Brazil was rapidly growing, a mandatory quarantine was declared in the country for all except essential services. Schools and universities were closed and their activities were suspended to minimize the speed of virus spread. Since then, most students have returned to their family home and most have had their routines completely changed, especially those whose university activities were their main occupation. Without precise knowledge of the full dimension of the pandemic, the administration and teaching staff began to perform their activities remotely, in parallel to discussing strategies for the safe return to normal academic activities. Thus, debates were held related to pedagogical content, use of online teaching tools, remote learning assessment techniques, internet access logistics, and teaching materials. A similar discussion occurred in 2009 during the H1N1 epidemic, placing them at risk for the development of psychological symptoms. The impact on mental health in pandemics is generally more severe on the most vulnerable populations, such as the elderly, those with chronic physical and psychological weaknesses, and health professionals at the front line of patient care. Few studies have been aimed at the population of university students and, therefore, there is an important gap to be filled. Such studies will provide subsidies for managers and educators for the proper management of academic activities and for the support of students in order to maintain not only teaching quality but also the well-being of this population.

Some symptoms are commonly associated with a pandemic context, such as depression, anxiety, stress, and mood swings. In a recent study in Chinese individuals, Gao et al. reported a depressive symptom prevalence of 48.3% (95% CI 46.9–49.7) and anxiety prevalence of 22.6% (95% CI 21.4–23.8), and a significant relationship between these symptoms and the time spent with pandemic news in the media was noted. Wang et al. reported a prevalence of 16.5% of moderate to severe depressive symptoms, 28.8% of anxiety, and 53.8% of moderate to severe psychological impact related to the pandemic in a Chinese sample. Studies on university students are scarce. Cao et al. reported that 24.9% of students showed symptoms of anxiety during the COVID-19 pandemic and attributed this finding to social isolation and decreased interpersonal communication. Specifically, in students, we believe that the identification of these symptoms could be relevant for the development of more assertive teaching and learning strategies. Van et al. highlighted that teaching institutions must seek a balance between academic continuity, infection control, and minimization of morbidity, both physical and mental.

In addition to the general symptoms of depression, anxiety, and stress that are commonly found in academic life, in the context of a pandemic the psychological impact directly related to the event (peri- and post-traumatic stress) should also be considered. Weiss proposed an instrument composed of 22 items distributed in three subscales: avoidance, intrusion, and hyperarousal. Avoidance relates to the effort of withdrawing from any stimulus that may bring memories related to the event, which can result in emotional distance and decreased social interaction, loss of interest in activities previously considered important, and increased isolation. Intrusion refers to symptoms of constantly reliving the event through invasive memories that are generally unpleasant and distressing. Hyperarousal is the exaggerated response to thoughts of the event and can be perceived through symptoms such as insomnia, irritability, difficulty concentrating, depressed mood, fatigue, tension, and vigor.

Due to the impact that the cited symptoms may have on students’ academic activities and accomplishments, this study aimed to evaluate aspects related to the mental health of undergraduate students in a pharmacy course considering the context before and during the COVID-19 pandemic.

Methods

Study design and sample

This was a cross-sectional study carried out in two phases. The first phase originated from another study protocol developed before confirmation of the first case of COVID-19 in the world. One of the aims of this study was to estimate students’ symptoms of depression, anxiety, and stress. All students (N = 530) enrolled in the undergraduate course of the school of pharmaceutical sciences of a public university in Brazil (São Paulo State University) were invited to participate in this phase. Data were collected in the second semester of 2019 (August to November) and a total of 294 students participated in this phase (response rate 55.5%). The second phase of the study was designed after the WHO characterized COVID-19 as a pandemic. In this phase, in addition to estimating the symptoms of depression, anxiety, and stress, we also aimed to assess peri-traumatic stress and mood swings during the pandemic. Those who participated in the first phase (n = 294) received the invitation to participate in the second phase of the study. Data were collected from 18 May to 25 June 2020.
Data were collected about sex, age, period and year of the course, average monthly family income, number of people living in the same house as the student, and time spent with the news about the pandemic or obtaining information about the new coronavirus, social isolation, and mental health (Table 1). Symptoms of depression, anxiety, stress, peri-traumatic stress (during the pandemic), and mood swings were evaluated using the Depression, Anxiety, and Stress Scale (DASS-21), the Impact of Event Scale - Revised (IES-R), and the BRUMS, described below.

Measuring instruments

The symptoms of depression, anxiety, and stress were assessed with the Portuguese version of DASS-21. The scale has 21 items divided into three factors with a four-point Likert-type response scale ranging from 0 to 3 (0 = did not apply to me at all, 1 = some of the time, 2 = a good part of time, 3 = most of the time). The scores were calculated by adding the answers of the items of each subscale and the participants were classified using the cutoff points proposed by Lovibond and Lovibond (depression: normal = 0 to 9, mild = 10 to 13, moderate = 14 to 20, severe = 21 to 27, extremely severe ≥28; anxiety: normal = 0 to 7, mild = 8 to 9, moderate = 10 to 14, severe = 15 to 19, extremely severe ≥20; stress: normal = 0 to 14, mild = 15 to 18, moderate = 19 to 25, severe = 26 to 33, extremely severe ≥34).

Symptoms related to peri-traumatic stress from the pandemic were identified using the Portuguese version of the IES-R. The tool contains 22 items distributed in three factors (avoidance, intrusion, and hyperarousal) rated on a five-point Likert-type scale ranging from 0 to 4 (0 = not at all, 1 = slightly, 2 = moderately, 3 = quite a bit, 4 = extremely). The general score (calculated by the
sum of responses) of the IES-R was used following the recommendation of Wang et al.\textsuperscript{19} to categorize individuals with levels of impairment as normal (0 to 23), mild (24 to 32), moderate (33 to 36), and severe (≥37). Then, the corresponding percentiles of the cutoff points were used for each subscale separately (avoidance and intrusion: normal = 0 to 8, light = 9 to 11, moderate = 12 to 13, severe ≥14; hyperarousal: normal = 0 to 6, light = 7 to 8, moderate = 9 to 10, severe ≥11).

The BRUMS was developed to allow a quick screening of mood state and was adapted to Portuguese by de Miranda Rohlfs et al.\textsuperscript{21} BRUMS has 24 simple mood indicators with responses on a five-point Likert scale on how much a certain mood is experienced (0 = not at all, 1 = a little, 2 = moderately, 3 = quite a bit, 4 = extremely). The scale has six subscales (anger, confusion, depression, fatigue, tension, and vigor) with four items each. The cutoff points for mood swings due to a stressful event are based on previously established percentiles in a reference population.\textsuperscript{21} Values below the 50th percentile (P50) for vigor and above P50 for the other subscales require attention.

**Procedures and ethical aspects**

Only students who agreed and signed the written informed consent participated in the study. In data collection from the first phase of the study, students individually filled out a demographic questionnaire and the DASS-21 paper version. Data collection during the pandemic (second phase of study) was carried out online using Google Forms. The students received the survey link via institutional email containing the demographic questionnaire, an exploratory questionnaire to evaluate aspects related to the pandemic context, DASS-21, IERS, and BRUMS (peri-traumatic stress and mood swings related to the pandemic).

This study was approved by the National Research Ethics Commission of the Ministry of Health of Brazil - CONEP.

**Data validity and reliability**

The validity and reliability of the DASS-21, IES-R, and BRUMS data were estimated using a confirmatory strategy and robust estimation method by weighted least squares means and variance adjusted, the ratio of chi square to degrees of freedom ($\chi^2$/df), comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and ordinal alpha coefficient ($\alpha$) indices.\textsuperscript{27,28} The MPLUS 7.2 (Muthén and Muthén) and R (R Core Team, “lavaan” and “semTools” packages) programs were used to carry out the analyses.

The data were considered valid and reliable (DASS-21: $\chi^2$/df = 1.49, CFI = 0.972, TLI = 0.968, RMSEA = 0.069, $\alpha$ = 0.882–0.932; IES-R: $\chi^2$/df = 1.56, CFI = 0.953, TLI = 0.947, RMSEA = 0.074, $\alpha$ = 0.856–0.916; BRUMS: $\chi^2$/df = 1.45, CFI = 0.977, TLI = 0.973, RMSEA = 0.066, $\alpha$ = 0.721–0.927).

**Data analysis**

The prevalence and 95% CI of the investigated outcomes were calculated. The mood swings were estimated in percentiles from the reference population. The relationship between the time spent with the news of the pandemic and the average scores of the factors of the instruments was estimated using Pearson's correlation coefficient ($r$). For decision making, a significance level of 5% was used.

To estimate the probability of having psychological symptoms according to sex, economic level (low, high), sense of safety in relation to the pandemic (safe, unsafe), health problems (absent, present), and frequency of socialization (lower than usual, the same, or higher than usual), a multiple logistic regression model was performed with calculation of the odds ratio per point and 95% CI.

**Results**

Sixty-six students participated in the second phase of the study (response rate = 22.4%; women = 75.8%; mean age = 21.7 years, SD = 3). Of the respondents, 80.3% were enrolled full-time, 28.8% were in the second year of the course, 22.7% in the third year, 13.6% in the fourth year, 13.6% in the fifth year, and 6.1% the sixth year, and 19.7% were working concurrently with their studies.

The average monthly family income of 4.5% of students was up to Brazilian real (R$) 1254, 13.6% R$1255 to R$2004, 63.7% R$2005 to R$8640, 9.1% R$8641 to R$11261, and 9.1% > R$11262 (US$1.00 = R$5.36, quotation of the Central Bank of Brazil, 1 July 2020).

The mean number of people living in the same home was 3.7 (SD = 1; minimum = 1, median = 4, maximum = 6) and the mean time spent per day listening, watching, or reading the news about the pandemic was 131.1 min (SD = 146.8 min; minimum = 0, median = 90 min, maximum = 18 h).

Table 1 presents the descriptive statistics related to the answers given to the sample characteristics’ questions.

Most students believed that the coronavirus is dangerous and that social isolation was important. A high proportion of students felt unsafe in relation to the pandemic and approximately half of the participants reported knowing someone who tested positive for the new coronavirus. In addition, most students reported that the pandemic had an impact on their mental health, and the most frequent symptoms were anxiety, anguish, insomnia, and fear.

Fig. 1 shows the prevalence (point estimate and 95% CI) of depression, anxiety, and stress symptoms among students before and during the pandemic. For this analysis, the mild, moderate, severe, and extremely severe levels were considered as the presence of these symptoms. It is observed that there was a significant increase in prevalence of depressive symptoms during the pandemic. The prevalence of anxiety symptoms decreased while the prevalence of general stress was unchanged between before and during the pandemic.
More than 70% (95% CI = 69.8–72.6) of the students had some psychological impact due to the pandemic, with 16.7% (95% CI = 15.6–17.8) having a mild impact, 9.1% (95% CI = 8.2–10) moderate, and 45.4% (95% CI = 43.9–46.9) severe, a finding that deserves attention.

Table 2 shows the prevalence of depression, anxiety, and stress symptoms, and avoidance, intrusion, and hyperarousal behaviors according to the level of impact in students during the pandemic.

| Instrument | Factor     | Normal p (%) | Mild p (%) | Moderate p (%) | Severe p (%) |
|------------|------------|--------------|------------|----------------|--------------|
| DASS-21    | Depression | 21.2 (19.9–22.5) | 9.1 (8.2–10.0) | 19.7 (18.5–20.9) | 50.0 (48.5–51.5) |
| Anxiety    | 47.0 (45.5–48.5) | 6.0 (5.4–6.8) | 19.7 (18.5–20.9) | 27.3 (25.9–28.6) |
| Stress     | 33.3 (31.9–34.7) | 19.7 (18.5–20.9) | 18.2 (17.0–19.4) | 28.8 (27.4–30.2) |
| IES-R      | Avoidance  | 19.7 (18.5–20.9) | 18.2 (17.0–19.4) | 13.6 (12.5–14.7) | 48.5 (47.0–50.0) |
| Intrusion  | 36.4 (14.9–37.9) | 15.1 (14.1–16.3) | 10.6 (9.7–11.5) | 37.9 (36.4–39.4) |
| Hyperarousal | 33.3 (31.9–34.7) | 16.7 (15.6–17.8) | 13.6 (12.5–14.7) | 36.4 (34.9–37.9) |

DASS-21 = Depression, Anxiety, and Stress Scale; IES-R = Impact of Event Scale - Revised; p = prevalence.

More than 70% (95% CI = 69.8–72.6) of the students had some psychological impact due to the pandemic, with 16.7% (95% CI = 15.6–17.8) having a mild impact, 9.1% (95% CI = 8.2–10) moderate, and 45.4% (95% CI = 43.9–46.9) severe, a finding that deserves attention.

Table 2 shows the prevalence of depression, anxiety, and stress symptoms, and avoidance, intrusion, and hyperarousal behaviors according to the level of impact during the pandemic.

The high prevalence of moderate and severe symptoms of depression, anxiety, and stress among students stood out. In addition, a high prevalence of avoidance, intrusion, and hyperarousal behaviors was found, which can complicate daily activities.
These results can be explained by the temporal orientation related to psychological symptoms. In this theory, the sense of unsafety in the pandemic significantly increased the student's chance of presenting depression and anxiety symptoms, and intrusive and hyperarousal behaviors. Having a health problem increased the likelihood of anxiety. Given the decrease in socialization, there is a greater chance of avoidance behavior.

**Discussion**

This survey highlights important psychological impacts of the COVID-19 pandemic on the mental health of undergraduate pharmacy students, indicating the need for careful and strategic planning to carry out academic activities, since students are clearly in a vulnerable condition. Thus, for resuming and maintaining academic activities, whether face-to-face or online, strategies for welcoming and monitoring students should be planned, preferably with the support of mental health professionals. The increased prevalence of depressive symptoms can suggest states of hopelessness, anhedonia, inertia, and loss of interest and involvement, which can also be confirmed by the high prevalence of avoidance behavior. The loss of interest in activities previously considered important will certainly lead to difficulty not only in attending classes, but also in assigning meaning to them, resulting in low absorption of the activity or distress.

Another aspect observed was a decrease in the prevalence of anxiety symptoms and maintenance of the prevalence of stress symptoms in the sample. These results can be explained by the temporal orientation related to psychological symptoms. In this theory, stress symptoms are related to stimuli of the present moment, anxiety to future threatening events, while depression symptoms are related to past stressors. Data from the second phase were collected at the beginning of the pandemic. Thus, it can be speculated that the students did not present psychic strategies for thinking and feeling oriented towards a future that until that moment had been diffuse and unpredictable. Regarding stress, the students had a high prevalence of stress symptoms related to the difficulties imposed in their academic routine before the pandemic. At the beginning of the pandemic, students' daily lives were interrupted, in which previous stressors disappeared and opened up space for new stressors. However, as the pandemic was a new situation, new stressors only overlapped previous stressors at that immediate moment, maintaining the prevalence of these symptoms. Still, according to this theory, in times of crisis and in high impact events (such as a pandemic), previous experiences are potentialized in the face of the losses inherent to the transformations that have occurred. This increases the chances of triggering depressive symptoms, which corroborates the data found in the present study.

Furthermore, the relationship between stress and anxiety symptoms and the impact of intrusion and hyperarousal behaviors must be carefully examined. The time of exposure to news related to the pandemic may have contributed to an increase in intrusive thoughts and hyperarousal, which was also observed by Gao et al. For these authors, in addition to the uncertainties related to the pandemic itself, there is a large amount of false or manipulated information, which can generate unfounded fear and confusion.

In addition to the health crisis caused by the pandemic, Brazilians are also experiencing a profound economic, social, and political crisis in the country that has permeated the news and has increased feelings of unsafety and fear. The effects of economic, social, and political crises on the population's mental health during a pandemic have been reported in previous studies. This whole context creates an environment of vulnerability and unpredictability that affects especially those who do not have enough skills to deal with the conflicts that this scenario imposes. States of hyperarousal (or hyperstimulation) can increase fear and anxiety and in many cases result in post-traumatic stress. In university students, the uncertainty about the future of their careers, economical restraints for their studies, the insecurity that accompanies change in pedagogical strategies, the interruption of interpersonal relationships, and...
the change in conditions for studying (e.g., physical facilities, access to the internet) can further aggravate the psychological impact of the pandemic and future decisions of these young adults.

Participants reported feeling unsafe, and a high prevalence of symptoms such as anxiety, anguish, insomnia, and fear was found, which corroborates previous studies.\(^{11,19}\) The feeling of unsafety significantly increases the likelihood of depression and anxiety symptoms, intrusive thoughts, and hyperarousal. Thus, ensuring that correct information about the pandemic and prevention methods is provided to students could increase their sense of safety. Such results could be accomplished, for example, through lectures, courses, and production of informative materials, which can be easily implemented within a pharmaceutical sciences school. In addition, it is suggested to include courses or activities aimed at mental health care for coping with the pandemic, concomitantly with the regular program of the school.

Another important aspect is the impact that decreased socialization, imposed by the quarantine, has on avoidance behavior.\(^{6,16}\) Administrators and professors must be aware of this fact during academic activities, since social interactions are being carried out differently than before the pandemic. Students not only have to adapt to new class and evaluation formats but also the reestablishment of bonds,\(^3\) and the time required to achieve those depends on each individual and can be especially difficult among first-year students.

Severe mood swings were also reported by students, which may be a consequence of social isolation or of the entire context of the pandemic.\(^{15}\) Students were predominantly tense, angry, mentally confused, and with depressed mood, which can make the accomplishment of academic activities a great challenge. These data highlight the need for careful planning of activities by professors so that students can endure a quality and significant learning process. Because of the psychological impacts of the pandemic on students, there is a risk of non-attendance and high rates of student dropout. Professors should also be prepared to deal with sensitive issues and situations that may arise during class.

Among the limitations of this study, a low response rate was attained. This could be a reflection of the data presented here, revealing depressive symptoms and avoidance behavior. Therefore, it is suggested that future studies consider these symptoms and behaviors to find different strategies in order to increase student adherence and engagement. Despite this limitation, this study can help educators and researchers facing the unprecedented context of the COVID-19 pandemic. In addition, the evidence was found to be valid and reliable, and provides new information in pharmaceutical sciences education.

Hopefully, this study may provide subsidies and foundation for educators, administrators, and the academic community during and after the COVID-19 pandemic to adopt measures to welcome and maintain or recover mental health of students so that the educational process can be fully accomplished. We also hope to provide a background for further investigations on the relation of pandemic-related mental health symptoms and individual characteristics of students.

**Conclusions**

During the COVID-19 pandemic, pharmacy students were highly vulnerable to the development of depressive symptoms, peri-traumatic stress, and mood swings. These conditions deserve attention, mainly from mental health professionals, but also from administrators and educators. Regardless of the methodology used for resuming or maintaining academic activities, this community needs a welcoming and careful approach.

**Author statement**

Juliana Alvares Duarte Bonini Campos contributed to conceptualization; formal analysis; funding acquisition; methodology; project administration; and writing the original draft. Lucas Arrais Campos contributed to conceptualization; data curation; funding acquisition; methodology; and writing, reviewing and editing the draft. Julia Lucio Bueno contributed to conceptualization; data curation; funding acquisition; methodology; and writing and reviewing the draft. Bianca Gonzalez Martins contributed to conceptualization; data curation; funding acquisition; methodology; and writing and reviewing the draft.

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**Declaration of competing interest**

None.

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