RESEARCH ARTICLE

# Mental health assessment of Lebanese pharmacy students after returning to school post-COVID-19: A cross-sectional study

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## Abstract

**Background:** The shift from normalcy caused by COVID-19 changed the lives of students globally. This study aims to assess the psychiatric symptoms and identify risk factors contributing to psychological distress in Lebanese pharmacy students after returning to school following COVID-19. **Methods:** An online cross-sectional study was conducted from 1 February to 30 March 2022 among Lebanese pharmacy students in Lebanon. Three validated scales were used to assess the mental health of the participants. **Results:** Of the total 866 participants, 41.8% had severe/extremely severe anxiety, 30.7% depression, 28.5% had stress, 27.7% had moderate/severe insomnia, and 45.5% had PTSD. **Conclusion:** This study revealed high levels of psychological distress in Lebanese pharmacy students after returning to school following COVID-19, highlighting the importance for faculty and educators to prioritise students by maintaining open communication and addressing their academic and personal needs. Further studies are warranted to confirm these results and check whether these symptoms are still ongoing.

## Introduction

A novel coronavirus termed Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) was first identified in China and was declared a pandemic by the World Health Organisation (WHO) in March 2020 (WHO, 2020). In Lebanon, the first case was reported on February 21, 2020, and officials from the Lebanese Ministry of Public Health confirmed the country's first case of COVID-19 (MOPH, 2020).

Various countries initiated lockdowns to limit people's movement and protect national borders from foreign agents. The lockdown was adopted on two fronts, i.e., domestic, where governments restricted people's movement and imposed confinement to homes, and international, where countries closed their national borders to control the movement of individuals and goods (Onyeaka *et al.,* 2021).

On March 15, 2020, due to the dramatic increase in the number of individuals testing positive for the virus and following the first SARS-CoV-2-related death, the Lebanese government declared a state of health emergency and shifted the measures into a complete lockdown to slow down the growth rate of COVID-19 cases (Azhari, 2020). At that time, Lebanon was considered to be successfully handling the pandemic until August 4, 2020, when a massive blast shook the port of Beirut, killing more than 190, injuring more than 6,000, and displacing 300,000 people (Amos & Rincon, 2020). During this period, the country started facing the third COVID-19 wave. Numbers began to rise, with Lebanon reporting over 1,000 cases on most days since mid-September (Koweyes *et al.,* 2021).

As a consequence of this deviation from normalcy caused by the COVID-19 pandemic, including the shift to digital learning, it was anticipated that university students would experience a decline in their mental health (Mjaess *et al.,* 2021; Pandey *et al.,* 2021). The effect of these events on their mental well-being post-pandemic is yet to be fully understood, as the COVID-19 crisis is ongoing. Available data on the mental health consequences of pandemics is based on previous outbreaks but could provide some insight into what may be expected following the COVID-19 era.

Data from previous outbreaks suggest that mental health distress may persist long after the pandemic/epidemic ends (Brooks *et al.,* 2020). In China (Huang, 2004), the aftermath of the Severe Acute Respiratory Syndrome (SARS) epidemic persisted, and potential anxiety arose in the population with every new outbreak of infectious diseases, such as the Middle East Respiratory Syndrome (MERS) or H1N1 flu (Institute of Medicine (US) Forum on Microbial Threats, 2004). SARS has generated a persisting negative mental impact, such as anxiety, depression, and post-traumatic stress disorder (PTSD), especially among healthcare workers and medical staff (Esterwood *et al.,* 2020). A study that evaluated depression among survivors of Ebola Virus Disease (EVD) reported severe depression in this population diagnosed between 1 and 19 months after discharge from an Ebola treatment centre (Keita *et al.,* 2017). Another study found that, after the end of the Ebola epidemic, nearly half of the participants reported symptoms of anxiety or depression, and three-quarters experienced PTSD symptoms (Jalloh *et al.,* 2018). Although mental health findings from previous pandemics could be influenced by demographic characteristics, measurement differences, and prior disasters, they could reflect the outcomes to expect after the COVID-19 pandemic.

Many studies have assessed the independent and combined effects of COVID-19 and economy-related variables on stress and anxiety among Lebanese adults (Salameh *et al.,* 2020; Sacre *et al.,* 2022); some others investigated the prevalence of psychiatric symptoms related to insomnia, depression, and anxiety in young Lebanese population during the COVID-19 lockdown (Younes *et al.,* 2021). However, to the best of our knowledge, none was conducted among Lebanese pharmacy students following the COVID-19 pandemic and after returning to school.

In the Middle East region, several studies carried out during the pandemic addressed the mental well-being of students and healthcare workers, mainly medical doctors and nurses, but only a few included pharmacy students (Salameh *et al.,* 2020; Kheradmand *et al.,* 2021; Rassoul, Razzak & Hashim, 2021; Bizri *et al.,* 2022;

Youssef *et al.,* 2022). Therefore, this study focuses on pharmacy students in Lebanon, considering that they are no exception to other healthcare students/workers since they are involved in on-site training stress and challenges due to COVID-19, which might contribute to high mental distress among them. This study aims to investigate the prevalence of psychiatric symptoms related to insomnia, depression, and anxiety and identify risk factors contributing to psychological stress in Lebanese pharmacy students after returning to school following the COVID-19 lockdown.

## Methods

### Study design and sampling

Using snowball sampling, an online cross-sectional study conducted from February 1, 2022, to March 30, 2022, recruited 866 Lebanese pharmacy students from all universities after returning to school following the COVID-19 pandemic.

Eligible participants were Lebanese pharmacy students, 18 years and above, enrolled in pharmacy schools across Lebanon during the 2021-2022 academic year from year one to PharmD. Exclusion criteria were students Non-Lebanese students who are not studying pharmacy in Lebanon. Eligibility criteria were available in the consent section at the beginning of the survey, which required around 10 to 15 minutes to complete. The objectives were explained on the first page of the survey. Participation was anonymous and voluntary, and participants received no compensation for joining the study. Completing the questionnaire was considered evidence of informed consent to participate in the study.

The investigators forwarded the questionnaire to their pharmacy students enrolled in different schools across Lebanon via WhatsApp. Participants were encouraged to share the survey with their contacts and accept or refuse to fill out the questionnaire. A reminder to fill out the questionnaire was sent on WhatsApp groups every few days.

### Sample size calculation

The CDC Epi-info software (version 7.2) was used to calculate the minimum sample size, estimating the Lebanese pharmacy students population at around 2000 individuals, with a confidence interval of 95% and an acceptable margin of error of ± 3. The minimum required sample, which was determined before any data analysis, was 696.

### Ethical aspect

The study was reviewed and approved by the Research and Ethics Committee of the School of Pharmacy at the Lebanese International University (LIU), Beirut.

### Survey tool

The online survey was created on Google Forms and consisted of closed-ended questions in English and Arabic. The authors translated the English version into Arabic and then performed the back-translation. Discrepancies between the original English version and the translated one were resolved by consensus.

The questionnaire was divided into two sections. The first section included the demographic characteristics of participants (gender, age, area of residence, education level, school name, marital status, number of children, employment, and income). It also comprised questions regarding the effects of COVID-19, including the financial aspect, on their families and relationships. Questions about lifestyle changes ever since the pandemic started (smoking, leisure, physical activity, caffeine, and alcohol intake) were also included, in addition to questions related to the learning process during COVID-19 (whether students were studying online or on-campus, how was their last pharmacy practice experience, the impact of the pandemic on their experience, and how did their academic performance change before and during COVID-19). The second section consisted of three validated scales to assess participants' mental health status during the pandemic.

### The Depression, Anxiety, and Stress Scale (DASS-21)

This 21-item tool comprises a set of three self-report scales of seven questions each, intended to measure the states of depression, anxiety, and stress during the past week. Items are rated on a 4-point Likert scale (0: Did not apply to me at all; 1: Applied to me to some degree, or some of the time; 2: Applied to me to a considerable degree or a good part of the time; 3: Applied to me very much or most of the time). The total score is calculated by summing the responses and multiplying by two. Depression status is categorised into normal (0–9), mild (10–13), moderate (14–20), severe (21–27), and very severe (>28). Anxiety status is categorised into normal (0–7), mild (8–9), moderate (10–14), severe (15–19), and very severe (>20). Stress is categorised into normal (0–14), mild (15–18), moderate (19–25), severe (26–28), and very severe (>29) (Lovibond & Lovibond, 1995; Zanon et al., 2021).

### The Impact of Event Scale-Revised (IES-R)

The IES-R scale is a 22-item self-report scale used to evaluate the degree of distress patients feel in response to

traumatic events during the past week (Beck *et al.,* 2008). In this case, the traumatic event is the COVID-19 pandemic. Responses were recorded on a 5-point Likert scale from 0 (not at all) to 4 (extremely), with a total score ranging from 0 to 88. A score of 24 or higher indicates partial PTSD or at least some symptoms, a score of 33 or higher suggests a probable PTSD diagnosis (represents the best cutoff point), and a score of 37 or higher is associated with suppressed immune system function, even ten years after the traumatic event (Weiss & Marmar, 1996).

### The Insomnia Severity Index (ISI)

This 7-item self-report instrument assesses the severity of insomnia during the last two weeks by measuring various aspects, such as difficulty initiating sleep, maintaining sleep, and early morning awakening. Responses were recorded on a 5-point Likert as follows: 0 (none), 1 (mild), 2 (moderate), 3 (severe) and 4 (very severe). The total score ranges from 0 to 28. and is categorised into normal (0–7), subthreshold (8–14), moderate (15–21), and severe (22–28) insomnia (Morin *et al.* 2011).

### Statistical analysis

The Statistical Package for the Social Sciences (SPSS) software version 25 was used for data analysis. A descriptive analysis was done using counts and percentages for categorical variables and means and standard deviations for continuous measures. The normality of the scales was checked by visual inspection of the histogram, while the skewness and kurtosis were below $|1.96|$. After checking the normality, the independent-sample t-test was used to compare the means of the scales used between two groups, while ANOVA was used to compare three or more means.

A multivariate analysis was performed, taking DASS-21, ISI, and IES-R as the dependent variables. Variables that showed a p-value <0.1 in the bivariate analysis were included in the model to eliminate potential confounders. A p-value less than 0.05 was considered significant.

## Results

### Sample characteristics

The sociodemographic and other characteristics of the participants are displayed in Table (I). Most participants were female (74.8%), 84.2% were below 25 years old, 95.3% lived with their families, and 70.2% were unemployed. Only 35.9% had a monthly income of over 5,000,000 LL. Also, 69.1% were financially affected by COVID-19, and 64.2% had their relationships affected by COVID-19.

## Table I: Sociodemographic characteristics (N=866)

| Variable | N (%) |
|---|---|
| **Gender** | |
| Male | 219 (25.2%) |
| Female | 647 (74.8%) |
| **Age in years** | |
| <25 | 728 (84.2%) |
| 25 – 30 | 121 (14.0%) |
| >30 | 16 (1.8%) |
| **Area of residence** | |
| Beirut | 222 (25.7%) |
| Bekaa | 243 (28.1%) |
| Mount Lebanon | 148 (17.1%) |
| North | 66 (7.6%) |
| South | 114 (13.1%) |
| Nabatieh | 28 (3.2%) |
| Akkar | 45 (5.2%) |
| **Marital status** | |
| Single/widowed/divorced | 801 (92.7%) |
| Married | 64 (7.3%) |
| **Number of children** | |
| No children | 832 (96.2%) |
| One | 18 (2.0%) |
| Two | 9 (1.0%) |
| More than two | 7 (0.8%) |
| **Residential situation** | |
| Living with family | 825 (95.3%) |
| Living alone | 28 (3.2%) |
| Living in dorms | 13 (1.5%) |
| **Employment status** | |
| Unemployed | 607 (70.2%) |
| Working in a pharmacy | 169 (19.4%) |
| Working in other health-related job | 25 (2.9%) |
| Working in a non-health-related job | 65 (7.5%) |
| **Monthly income** | |
| <1,500,000 L.L | 95 (11.0%) |
| 1,500,000-3,000,000 L.L | 232 (26.8%) |
| >3,000,000-5,000,000 L.L | 227 (26.2%) |
| >5,000,000-10,000,000 L.L | 175 (20.2%) |
| >10,000,000 L.L | 136 (15.7%) |
| **Family financially affected by COVID-19** | |
| Yes | 598 (69.1%) |
| No | 267 (30.9%) |
| **Relationship affected by COVID-19** | |
| Yes | 555 (64.2%) |
| No | 310 (35.8%) |

## Table II: Learning type and other characteristics (N=866)

| Variable | N (%) |
|---|---|
| **School of pharmacy** | |
| Lebanese International University | 739 (85.3%) |
| Lebanese University | 52 (6.0%) |
| Beirut Arab University | 66 (7.6%) |
| Saint Joseph University | 4 (0.5%) |
| Lebanese American University | 2 (0.2%) |
| Other | 3 (0.3%) |
| **Year of pharmacy education** | |
| First | 20 (2.2%) |
| Second | 59 (6.8%) |
| Third | 154 (17.8%) |
| Four | 195 (22.5%) |
| Fifth | 340 (39.3%) |
| PharmD | 98 (11.3%) |
| **Leisure activities compared to before COVID-19** | |
| More than before COVID-19 | 169 (19.5%) |
| Less than before COVID-19 | 696 (80.5%) |
| **Smoking status** | |
| Cigarettes | 47 (5.4%) |
| Shisha | 636 (73.5%) |
| Electronic cigarettes | 22 (2.5%) |
| Non-smoker | 160 (18.5%) |
| **Caffeine intake since COVID-19** | |
| Stayed the same | 344 (39.8%) |
| Increased | 316 (36.5%) |
| Decreased | 49 (5.7%) |
| Do not drink caffeine | 156 (18.0%) |
| **Alcohol intake since COVID-19** | |
| Stayed the same | 80 (9.2%) |
| Increased | 34 (3.9%) |
| Decreased | 21 (2.4%) |
| Do not drink alcohol | 730 (84.4%) |
| **COVID-19 affect the Sports/ workout routine** | |
| I work out more | 103 (11.9%) |
| I work out less | 277 (32.0%) |
| Same workout intensity | 135 (15.6%) |
| Do not workout | 350 (40.5%) |
| **Type of learning** | |
| Online | 445 (51.3%) |
| On-campus | 11 (1.3%) |
| Both online and on campus | 410 (47.4%) |
| **Satisfied online learning** | |
| Yes | 306 (37.1%) |
| No | 516 (62.9%) |
| **The last pharmacy or hospital experience was** | |
| Online | 335 (38.6%) |
| In pharmacy/hospital | 531 (61.4%) |
| **Satisfied with online training** | |
| Yes | 130 (24.8%) |
| No | 395 (75.2%) |
| **GPA before COVID-19** | |
| <2 | 8 (0.9%) |
| 2.00 – 3.19 | 247 (28.6%) |
| 3.20 – 3.49 | 263 (30.4%) |
| 3.50 – 4.00 | 347 (40.1%) |
| **GPA during COVID-19** | |
| <2 | 10 (1.2%) |
| 2.00 – 3.19 | 344 (39.7%) |
| 3.20 – 3.49 | 262 (30.3%) |
| 3.50 – 4.00 | 250  8.9%) |

### *Description of the studying status*

Most students (85.3%) studied at the Lebanese International University (LIU), 62.9% were not satisfied with online learning, and 75.2% were not satisfied with online training. Only 11.3% had a PharmD degree, and 40.1% had a GPA between 3.5 and 4 before COVID-19; this percentage decreased to 28.9% during the pandemic. The majority of students (80.5%) had fewer leisure activities than before COVID-19. Caffeine intake and workout intensity since COVID-19 remained the same for 39.8% and 15.6% of the participants, respectively (Table II).

### Description of the scales used

Table III describes the median, mean, SD, and range of the scales used in this study. The means depression, anxiety and stress scale were 15.35, 14.10 and 19.51, respectively. The mean insomnia severity index was 10.11 ± 6.66, and the mean impact of events scale was 33.73 ± 22.92.

Of the total sample, 30.7% had severe/extremely severe depression, 41.8% had anxiety, and 28.5% had stress. Also, 27.7% had moderate/severe insomnia, and 45.5% had PTSD (Table IV).

**Table III: Description of the scales used in the study**

|  | Median | Mean | SD | Minimum | Maximum |
|---|---|---|---|---|---|
| **Depression, Anxiety and Stress Scale - 21 Items (DASS-21)** |  |  |  |  |  |
| Depression | 14.00 | 15.35 | 11.47 | 0 | 42 |
| Anxiety | 12.00 | 14.10 | 10.71 | 0 | 42 |
| Stress | 18.00 | 19.51 | 11.51 | 0 | 42 |
| **Insomnia Severity Index** | 9.00 | 10.11 | 6.66 | 0 | 28 |
| **Impact of Events Scale-Revised** | 32.00 | 33.73 | 22.92 | 0 | 88 |

**Table IV: The proportion of the scales used in this study**

|  | Frequency | Percentage |
|---|---|---|
| **Depression, Anxiety and Stress Scale - 21 Items (DASS-21)** |  |  |
| Depression |  |  |
| Normal | 313 | 36.2 |
| Mild | 107 | 12.4 |
| Moderate | 179 | 20.7 |
| Severe | 110 | 12.7 |
| Extremely severe | 156 | 18.0 |
| Anxiety |  |  |
| Normal | 278 | 32.1 |
| Mild | 57 | 6.6 |
| Moderate | 168 | 19.4 |
| Severe | 98 | 11.3 |
| Extremely severe | 264 | 30.5 |
| Stress |  |  |
| Normal | 212 | 24.5 |
| Mild | 243 | 28.1 |
| Moderate | 163 | 18.8 |
| Severe | 143 | 16.5 |
| Extremely severe | 104 | 12.0 |
| **Insomnia Severity Index** |  |  |
| No clinically significant insomnia | 345 | 39.9 |
| Subthreshold insomnia | 281 | 32.5 |
| Clinical insomnia (moderate severity) | 190 | 22.0 |
| Clinical insomnia (severe) | 49 | 5.7 |
| **Impact of Events Scale-Revised** |  |  |
| Absence of PTSD | 321 | 37.1 |
| Partial PTSD or at least some of the symptoms | 115 | 13.3 |
| Probable diagnosis of PTSD | 35 | 4.0 |
| PTSD diagnosis | 394 | 45.5 |

### Bivariate analysis

The bivariate analysis taking the DASS-21, ISI, and IES-R scales as the dependent variables showed significantly higher means of depression, anxiety, stress, insomnia and PTSD among females, those whose relationship or financial status were affected by COVID-19, first-year pharmacy students, those with increased caffeine intake since COVID-19, those who were not satisfied with online learning, and those whose last year of

pharmacy education or hospital experience was online. Also, participants with a low monthly income, those who had decreased sports activity since COVID-19, who were learning online, and who had a GPA less than 2 during COVID-19 had higher means of depression and anxiety (Table V).

A higher mean depression was found in those who were not satisfied with online training, and a higher mean anxiety was found in those consuming alcohol (increased level *vs* other groups). In addition, higher mean stress was found in those whose alcohol intake has increased, whose sports activity decreased, and those who were not satisfied with online training and learning. Higher mean insomnia was found in those with increased alcohol intake, decreased sports activities, those who were not satisfied with online training, and those with a GPA between 2 and 3.19. A higher mean PTSD was found in those with a low monthly income, increased alcohol intake, studying online, and those who had a GPA less than 2 before COVID-19.

**Table V: Bivariate analysis taking the DASS-21, ISI and IES-R as the dependent variables**

| | Depression Mean ± SD | Anxiety Mean ± SD | Stress Mean ± SD | ISI Mean ± SD | IES-R Mean ± SD |
|---|---|---|---|---|---|
| **Gender** | | | | | |
| Male | 13.60±11.18 | 10.96±9.35 | 15.45±10.83 | 9.77±6.58 | 30.19±22.47 |
| Female | 15.95±11.51 | 15.16±10.93 | 20.88±11.42 | 10.22±6.69 | 34.92±22.97 |
| *p-value* | **0.009** | **<0.001** | **<0.001** | **0.395** | **0.008** |
| **Age in years** | | | | | |
| <25 | 15.35±11.37 | 14.01±10.56 | 19.43±11.43 | 10.11±6.65 | 33.75±22.66 |
| >25 | 15.37±12.01 | 14.58±11.49 | 19.95±11.94 | 10.08±6.76 | 33.62±24.32 |
| *p-value* | 0.989 | 0.592 | 0.625 | 0.951 | 0.953 |
| **Marital status** | | | | | |
| Single/widowed/divorced | 15.32±11.42 | 14.09±10.68 | 19.48±11.48 | 10.14±6.66 | 33.69±22.77 |
| Married | 15.80±12.11 | 14.25±11.12 | 19.90±11.97 | 9.63±6.65 | 34.17±24.95 |
| *p-value* | 0.747 | 0.910 | 0.780 | 0.555 | 0.874 |
| **Employment status** | | | | | |
| Unemployed | 15.89±11.67 | 14.46±10.88 | 19.79±11.61 | 10.33±6.66 | 34.08±23.00 |
| Employed | 14.10±10.89 | 13.25±10.27 | 18.84±11.26 | 9.59±6.64 | 32.90±22.75 |
| *p-value* | **0.036** | 0.128 | 0.265 | 0.138 | 0.488 |
| **Pharmacy school type** | | | | | |
| Lebanese International university | 15.47±11.48 | 14.28±10.73 | 19.65±11.56 | 10.20±6.74 | 34.28±23.01 |
| Other | 14.70±11.43 | 13.07±10.55 | 18.72±11.21 | 9.59±6.19 | 30.52±22.22 |
| *p-value* | 0.489 | 0.238 | 0.403 | 0.347 | 0.088 |
| **Monthly income** | | | | | |
| Low | 16.74±11.92 | 15.27±11.37 | 20.39±11.96 | 10.62±6.83 | 36.55±24.39 |
| Intermediate | 15.11±11.27 | 13.48±10.42 | 19.13±11.26 | 9.90±6.55 | 32.77±21.79 |
| High | 12.75±10.46 | 13.11±9.66 | 18.51±11.05 | 9.51±6.54 | 29.78±21.86 |
| *p-value* | **0.002** | **0.040** | 0.187 | 0.183 | **0.008** |
| **Family financially affected by COVID-19** | | | | | |
| Yes | 16.97±11.86 | 15.79±10.93 | 21.24±11.70 | 10.91±6.78 | 37.16±22.79 |
| No | 11.73±9.59 | 10.31±9.14 | 15.64±10.05 | 8.30±6.02 | 26.05±21.33 |
| *p-value* | **<0.001** | **<0.001** | **<0.001** | **<0.001** | **<0.001** |
| **Relationship affected by COVID-19** | | | | | |
| Yes | 17.31±11.72 | 16.06±10.70 | 21.72±11.42 | 11.17±6.73 | 37.39±22.89 |
| No | 11.85±10.10 | 10.60±9.81 | 15.55±10.57 | 8.20±6.09 | 27.17±21.50 |
| *p-value* | **<0.001** | **<0.001** | **<0.001** | **<0.001** | **<0.001** |
| **Year of pharmacy education** | | | | | |
| First | 23.26±12.80 | 18.73±11.49 | 24.63±11.50 | 12.63±7.60 | 43.10±26.37 |
| Second | 16.74±10.49 | 16.23±10.18 | 20.61±10.38 | 12.74±6.39 | 38.25±21.70 |
| Third | 17.45±11.53 | 14.66±10.74 | 20.76±11.97 | 11.05±7.11 | 38.20±23.24 |
| Four | 16.28±11.25 | 14.90±10.52 | 20.43±11.47 | 10.15±6.50 | 34.77±21.34 |
| Fifth | 13.83±11.44 | 13.16±10.84 | 18.39±11.48 | 9.55±6.46 | 31.15±23.46 |
| Pharm D | 13.14±10.93 | 12.73±10.34 | 17.95±11.15 | 8.40±6.25 | 29.03±21.75 |
| *p-value* | **<0.001** | **0.040** | **0.030** | **<0.001** | **0.001** |

| | Depression Mean ± SD | Anxiety Mean ± SD | Stress Mean ± SD | ISI Mean ± SD | IES-R Mean ± SD |
|---|---|---|---|---|---|
| **Caffeine intake since COVID-19 has** | | | | | |
| Stayed the same | 12.71±10.39 | 11.20±9.54 | 16.58±10.66 | 8.73±6.29 | 29.99±22.22 |
| Increased | 18.05±12.08 | 17.23±10.94 | 23.02±11.40 | 11.60±6.71 | 39.78±22.31 |
| Decreased | 18.20±11.58 | 16.97±10.43 | 22.04±11.89 | 12.26±5.94 | 35.75±22.77 |
| Do not drink caffeine | 14.83±11.08 | 13.25±10.91 | 18.06±11.43 | 9.44±6.84 | 29.08±23.12 |
| *p-value* | **<0.001** | **<0.001** | **<0.001** | **<0.001** | **<0.001** |
| **Alcohol intake since COVID-19 has** | | | | | |
| Stayed the same | 15.45±11.65 | 13.30±10.99 | 18.57±11.73 | 9.81±6.39 | 33.00±23.27 |
| Increased | 20.11±11.96 | 21.82±9.92 | 25.23±11.34 | 13.97±6.20 | 47.70±21.59 |
| Decreased | 16.85±11.53 | 13.04±8.73 | 20.47±10.78 | 9.04±7.10 | 36.90±20.70 |
| Do not drink alcohol | 15.08±11.39 | 13.86±10.64 | 19.32±11.46 | 9.99±6.65 | 33.07±22.83 |
| *p-value* | 0.084 | **<0.001** | **0.026** | **0.006** | **0.003** |
| **COVID-19 affect the Sports/ workout routine** | | | | | |
| I workout more | 16.09±12.29 | 14.52±10.68 | 19.76±12.41 | 10.40±6.95 | 35.58±25.07 |
| I workout less | 17.02±11.76 | 15.45±11.23 | 21.03±11.92 | 11.27±6.87 | 35.37±23.22 |
| Same workout intensity | 11.85±10.84 | 11.28±10.22 | 15.62±11.11 | 8.20±6.51 | 29.20±22.31 |
| Do not workout | 15.17±10.94 | 14.00 ±10.30 | 19.73±10.74 | 9.84±6.29 | 33.64±22.10 |
| *p-value* | **<0.001** | **0.003** | **<0.001** | **<0.001** | 0.061 |
| **Type of study** | | | | | |
| Online | 16.61±11.71 | 14.91±10.66 | 20.51±11.44 | 10.45±6.66 | 36.23±22.93 |
| On-campus | 13.63±9.28 | 10.36±7.83 | 16.36±9.62 | 9.18±7.34 | 24.63±15.11 |
| Both online and on campus | 14.04±11.11 | 13.32±10.76 | 18.51±11.55 | 9.76±6.64 | 31.26±22.79 |
| *p-value* | **0.004** | **0.048** | **0.027** | 0.292 | **0.003** |
| **Satisfied with the way of studying online** | | | | | |
| Yes | 13.41±10.98 | 12.76±10.56 | 17.25±11.04 | 9.36±6.61 | 30.49±22.48 |
| No | 16.95±11.68 | 15.23±10.77 | 21.08±11.73 | 10.61±6.78 | 36.05±23.01 |
| *p-value* | **<0.001** | **0.001** | **<0.001** | **0.010** | **0.001** |
| **The last pharmacy or hospital experience was** | | | | | |
| Online | 17.34±11.64 | 15.34±11.17 | 20.73±11.57 | 11.02±6.95 | 36.27±23.37 |
| In pharmacy/hospital | 14.10±11.19 | 13.32±10.34 | 18.74±11.41 | 9.54±6.41 | 32.13±22.51 |
| *p-value* | **<0.001** | **0.008** | **0.013** | **0.002** | **0.010** |
| **Satisfied with the online way of training** | | | | | |
| Yes | 14.03±11.27 | 13.41±10.57 | 17.64±11.48 | 9.43±6.57 | 31.63±22.88 |
| No | 17.16±11.65 | 15.22±11.08 | 20.61±11.81 | 10.79±6.89 | 35.43±23.50 |
| *p-value* | **0.008** | 0.104 | **0.013** | **0.045** | 0.108 |
| **GPA before COVID-19** | | | | | |
| <2 | 21.75±9.40 | 19.25±11.80 | 26.25±8.77 | 8.00±5.26 | 52.87±17.69 |
| 2.00 – 3.19 | 15.42±11.87 | 13.83±10.76 | 19.18±12.01 | 10.48±6.90 | 32.97±23.84 |
| 3.20 – 3.49 | 15.31±10.96 | 14.11±10.22 | 18.94±10.88 | 9.83±6.48 | 31.90±21.46 |
| 3.50 – 4.00 | 15.19±11.59 | 14.17±11.01 | 20.02±11.63 | 10.10±6.66 | 35.21±23.22 |
| *p-value* | 0.465 | 0.568 | 0.232 | 0.563 | **0.029** |
| **GPA during COVID-19** | | | | | |
| <2 | 21.40±7.54 | 22.20±8.56 | 24.20±7.56 | 9.00±4.59 | 49.30±20.47 |
| 2.00 – 3.19 | 16.62±12.18 | 14.65±10.96 | 20.37±12.23 | 11.01±6.94 | 35.07±24.33 |
| 3.20 – 3.49 | 15.36±11.01 | 14.42±10.78 | 19.14±10.94 | 9.52±6.65 | 32.39±22.01 |
| 3.50 – 4.00 | 13.37±10.76 | 12.69±10.16 | 18.52±11.11 | 9.53±6.22 | 32.67±21.71 |
| *p-value* | **0.002** | **0.011** | 0.127 | **0.014** | 0.065 |

**\*Values marked in bold are significant**

### Multivariable analysis

The multivariable analysis taking the DASS-21, ISI and IES-R scales as the dependent variables are displayed in Table VI.

Taking the anxiety scale as the dependent variable, increased caffeine (Beta=1.91) and alcohol (Beta=7.32) intake and relationships (Beta=3.63) and family financial status (Beta=3.70) affected by COVID-19 were significantly associated with higher anxiety. However,

being a male (Beta=-4.36), having a GPA between 3.5–4.0 during COVID-19 (Beta=-2.47), unchanged caffeine intake (Beta=-2.21), and being enrolled in the final years of pharmacy (Beta=-0.88) were significantly associated with lower anxiety.

Considering the stress scale as the dependent variable, increased caffeine (Beta=3.70) and alcohol (Beta=5.09) intake, relationships (Beta=4.48) and family financially (Beta=3.40) affected by COVID-19, and GPA between 2–3.19 (Beta=1.97) were significantly associated with higher stress. However, being a male (Beta=-5.22), unchanged sports activities (Beta=-2.48), and being enrolled in the final years of pharmacy (Beta=-0.96) were significantly associated with lower stress.

Taking the insomnia scale as the dependent variable, increased caffeine (Beta=1.65) and alcohol (Beta=3.13) intake, relationships (Beta=2.19) and family financially

(Beta=1.51) affected by COVID-19, GPA between 2.0–3.19 during COVID-19 (Beta=1.32), and decreased physical activity (Beta=1.00) were significantly associated with higher insomnia. However, unchanged sports activity (Beta=-1.45) and being enrolled in the final years of pharmacy (Beta=-0.93) were significantly associated with lower insomnia.

Taking the PTSD scale as the dependent variable, increased caffeine (Beta=6.48) and alcohol (Beta=12.46) intake and relationships (Beta=7.20) and family financially (Beta=6.68) affected by COVID-19 were significantly associated with higher PTSD. However, being a male (Beta=-4.83), being satisfied with online learning (Beta=-3.79), having an intermediate or high income (Beta= -4.03 and Beta=-7.00, respectively), and being enrolled in the early years of pharmacy (Beta=-2.81) were significantly associated with lower PTSD.

**Table VI: Multivariable analysis**

| | Unstandardised Beta | Standardised Beta | p-value | Confidence interval | |
|---|---|---|---|---|---|
| | | | | Lower Bound | Upper Bound |
| **Model 1: Linear regression taking the Depression scale as the dependent variable** | | | | | |
| Relationship affected by COVID-19 (Yes *vs* No*) | 3.847 | 0.161 | <0.001 | 2.284 | 5.409 |
| Pharmacy Year | -1.378 | -0.144 | <0.001 | -1.972 | -0.785 |
| Caffeine increased | 2.665 | 0.112 | 0.001 | 1.153 | 4.177 |
| Family financially affected by COVID-19 (Yes *vs* No*) | 3.234 | 0.130 | <0.001 | 1.606 | 4.863 |
| GPA during COVID-19 (3.50 − 4.00 *vs* <2*) | -2.790 | -0.110 | 0.001 | -4.382 | -1.197 |
| Gender (Male *vs* female*) | -2.326 | -0.088 | 0.007 | -4.004 | -0.648 |
| Studying online | 1.731 | 0.075 | 0.017 | 0.305 | 3.158 |
| Workout routine have stayed the same | -2.369 | -0.075 | 0.019 | -4.349 | -0.389 |
| Alcohol increased | 4.340 | 0.074 | 0.021 | 0.646 | 8.034 |
| Family income (High *vs* low*) | -2.058 | -0.065 | 0.040 | -4.023 | -0.092 |
| **Model 2: Linear regression taking the anxiety scale as the dependent variable** | | | | | |
| Relationship affected by COVID-19 (Yes *vs* No*) | 3.637 | 0.163 | <0.001 | 2.203 | 5.070 |
| Caffeine increased | 1.914 | 0.086 | 0.030 | 0.183 | 3.644 |
| Family financially affected by COVID-19 (Yes *vs* No*) | 3.707 | 0.160 | <0.001 | 2.227 | 5.188 |
| Gender (Male *vs* female*) | -4.361 | -0.177 | <0.001 | -5.886 | -2.835 |
| Alcohol increased | 7.321 | 0.133 | <0.001 | 3.942 | 10.700 |
| Pharmacy Year | -0.887 | -0.099 | 0.001 | -1.429 | -0.345 |
| GPA during COVID-19 (3.50 − 4.00 *vs* <2*) | -2.476 | -0.105 | 0.001 | -3.933 | -1.019 |
| Caffeine stayed the same | -2.212 | -0.101 | 0.010 | -3.902 | -0.522 |
| **Model 3: Linear regression taking the stress scale as the dependent variable** | | | | | |
| Relationship affected by COVID-19 (Yes *vs* No*) | 4.482 | 0.187 | <0.001 | 2.950 | 6.013 |
| Caffeine increased | 3.709 | 0.155 | <0.001 | 2.226 | 5.193 |
| Gender (Male *vs* female*) | -5.228 | -0.197 | <0.001 | -6.885 | -3.571 |
| Family financially affected by COVID-19 (Yes *vs* No*) | 3.400 | 0.136 | <0.001 | 1.811 | 4.988 |
| Pharmacy Year | -0.966 | -0.101 | 0.001 | -1.547 | -0.386 |
| Alcohol increased | 5.096 | 0.086 | 0.006 | 1.474 | 8.717 |
| GPA during COVID-19 (2.00 − 3.19 *vs* <2*) | 1.975 | 0.084 | 0.008 | 0.522 | 3.428 |
| Workout routine have stayed the same | -2.483 | -0.078 | 0.012 | -4.427 | -0.539 |
| **Model 4: Linear regression taking the ISI scale as the dependent variable** | | | | | |
| Relationship affected by COVID-19 (Yes *vs* No*) | 2.199 | 0.156 | <0.001 | 1.249 | 3.148 |
| Pharmacy Year | -0.938 | -0.167 | <0.001 | -1.297 | -0.580 |
| Caffeine increased | 1.658 | 0.119 | <0.001 | 0.748 | 2.567 |
| Family financially affected by COVID-19 (Yes *vs* No*) | 1.519 | 0.104 | 0.002 | 0.537 | 2.501 |
| GPA during COVID-19 (2.00 − 3.19 *vs* <2*) | 1.323 | 0.096 | 0.003 | 0.443 | 2.204 |
| Workout routine have stayed the same | -1.450 | -0.077 | 0.025 | -2.713 | -0.186 |
| Alcohol increased | 3.137 | 0.091 | 0.006 | 0.922 | 5.351 |
| Workout routine was less than before | 1.009 | 0.070 | 0.040 | 0.046 | 1.971 |

| Model 5: Linear regression taking the IES-R scale as the dependent variable | | | | | |
|---|---|---|---|---|---|
| Family financially affected by COVID-19 (Yes *vs* No*) | 6.682 | 0.135 | <0.001 | 3.336 | 10.028 |
| Caffeine increased | 6.481 | 0.136 | <0.001 | 3.394 | 9.569 |
| Pharmacy Year | -2.812 | -0.147 | <0.001 | -4.030 | -1.595 |
| Relationship affected by COVID-19 (Yes *vs* No*) | 7.209 | 0.150 | <0.001 | 3.998 | 10.420 |
| Alcohol increased | 12.462 | 0.107 | 0.001 | 4.933 | 19.990 |
| Gender (Male *vs* female*) | -4.833 | -0.091 | 0.005 | -8.221 | -1.445 |
| Satisfied with the way of studying online (Yes *vs* No*) | -3.797 | -0.080 | 0.014 | -6.834 | -0.761 |
| Family income (High *vs* low*) | -7.007 | -0.110 | 0.002 | -11.466 | -2.549 |
| Family income (Intermediate *vs* low*) | -4.037 | -0.088 | 0.013 | -7.227 | -.846 |

*Reference group*

## Discussion

This study assessed the prevalence of symptoms of depression, anxiety, insomnia, and PTSD and their related risk factors in Lebanese pharmacy students following the COVID-19 lockdown. It showed high levels of psychological pressure among pharmacy students post-COVID-19. These findings are consistent with those of a study done in Jordan, where 65% of medical students reported more depression and anxiety after COVID-19 (Al-Husban *et al.,* 2021). Similarly, a study done in Zambia reported moderate to severe anxiety among 41.8% of pharmacy students (Mudenda *et al.,* 2021). Conversely, medical students in the United Arab Emirates (UAE), especially females, had higher anxiety before online learning and decreased anxiety after switching to e-learning (Saddik *et al.,* 2020). Moreover, a total of 27.7% of our participants experienced moderate to severe insomnia. In a comparable survey of healthcare students in the Kingdom of Saudi Arabia (KSA), 61.41% reported poor sleep and frequent nightmares (Rabbani *et al.,* 2021). Another research in Egypt found that 93.1% of nursing students suffered from mild/moderate insomnia (Metwally Elsayed *et al.,* 2021). In contrast, a Chinese study showed that the prevalence of insomnia during the COVID-19 remission time was not higher compared to the outbreak period (Zhang *et al.,* 2021).

Also, 45.5% of our participants had PTSD symptoms following COVID-19. According to a study conducted in the KSA, PTSD was more prevalent in female medical students (Ifthikar *et al.,* 2021). On the contrary, another study revealed that 44.5% of college nursing students exhibited PTSD symptoms, with men being at greater risk (Gao *et al.,* 2021). A Jordanian study showed that 47.37% of healthcare students, including pharmacy and medical students, were more stressed when they consumed more coffee (Elsalem *et al.,* 2020), while in Egypt, university students with high-stress levels and insomnia were predominantly females, had a pre-existing sleep disorder, or used coffee (Richards & Smith, 2015; Dongol *et al.,* 2022), which is consistent with our findings because those who increased their caffeine intake had higher stress levels and insomnia. Furthermore, our results show that females experienced higher degrees of

psychological distress in response to the pandemic, which is in line with the findings of numerous previous studies where females had higher levels of distress following the epidemic (Al-Rabiaah *et al.,* 2020; Lee *et al.,* 2021; Harries *et al.,* 2021; Younes *et al.,* 2021; Zhan *et al.,* 2021).

In the present study, participants whose workout routine has been consistent after COVID-19 had a decreased risk of depression, stress, and insomnia, similar to previous findings showing the benefic effect of physical activity on the mental health of college and medical students (Soltani, Samieefar & Akhlaghdoust, 2022; Zhang *et al.,* 2022).

Our results showed that participants who had poorer personal relationships and a worse financial situation had higher levels of depression, anxiety, and stress; similarly, in a study of university students in the United Kingdom, students who exercised less and communicated less with friends/family had higher levels of depression and anxiety (Chen *et al.,* 2022). Most participants reported that COVID-19 detrimentally affected their relationships, families, and finances, consistent with the findings of a study on the post-traumatic growth and resilience among American medical students during the COVID-19 pandemic, which resulted in a significant increase in their stress, depression, insomnia, and PTSD levels (Luo *et al.,* 2022). In a comparable study, 60% of pharmacy students reported being extremely concerned about their finances, which was related to higher levels of depression (Davis *et al.,* 2021). Another study found that lower-income pharmacy students had a higher rate of psychological problems (Al-Qerem *et al.,* 2022).

In our study, 75.2% of participants were unsatisfied with their online training, which was associated with a drop in GPA for some students after COVID-19 and an increase in distress levels and depression. Our findings are consistent with previous literature reporting the negative impact of online training on students' performance and achievements (Dabbous *et al.,* 2022, Sakr *et al.,* 2022a). Similarly, when comparing online activities to traditional training in another study, 71.4% of pharmacy students stated that online training was less

effective than traditional training (Alzubaidi *et al.,* 2021), and 58.4% of medical students in Jordan expressed concern about their inability to obtain clinical sessions, which affected their level of study (Seetan *et al.,* 2021). Nonetheless, a recent study found that, owing to the convenience of access and reasonable schedules, UAE pharmacy students are very satisfied with online placements (Rabbani *et al.,* 2021). Likewise, a study in the UAE showed that 76% of college students reported an improvement in their GPA during the pandemic term and that online assessment had succeeded in reducing their stress levels (Mosleh *et al.,* 2022).

According to our findings, higher pharmacy years were associated with lower levels of depression, anxiety, stress, insomnia, and PTSD. This difference may be attributed to the age, culture, and maturity of senior students, as well as their increased responsibility for their education, training experience, and future profession. This result emphasizes the need for academics and educators to listen to young students and consider their perspectives on how these burdens might be lifted.

Although pharmacy students are expected to demonstrate a high level of professional skills and competence in providing patient care and services upon graduation (Dabbous *et al.,* 2020; Chahine *et al.,* 2021; Sabra *et al.,* 2022; Sakr *et al.,* 2022b), teachers and educators should improve the curriculum and teaching techniques. For instance, they could reduce student burden by making lectures more participatory, entertaining, and less stressful. In times of pandemics, teachers should educate students on mental health support/therapy and engage them in programmes that expand their understanding of this evolving subject. Also, family members should be aware of the pressures and difficulties that pharmacy students encounter in terms of social life, academic performance, and experiential training. As a result, they should receive additional support from their family to alleviate any avoidable psychological discomfort.

Further research on the relationship between university grades and psychological distress is needed. Likewise, no data on COVID-19's long-term effects are currently available. This study unveiled primarily negative attitudes towards e-learning and significant levels of depression, stress, and anxiety, particularly among females, which was predicted and consistent with numerous previous studies conducted globally. Nonetheless, some favourable views were observed during the COVID-19 lockdowns in other research, where some students thought that e-learning was a valuable tool, and they adapted physically and psychologically to the new normality measures. Further research about the long-term mental health of pharmacy students in

Lebanon following COVID-19 has still to be uncovered and examined.

### Strengths and limitations

This study is the first to assess the mental health of Lebanese pharmacy students after returning to school post-COVID-19. In terms of data collection, the researchers ensured that only pharmacy students filled it out. Because the sample size was relatively large and included pharmacy students from all over Lebanon, the outcomes were more diverse. Furthermore, three validated scales, which have been used across the literature and fulfil the purpose of the study, were utilised in the questionnaire.

However, this study has some limitations. The fact that the data were collected online through a self-reported questionnaire may have resulted in information bias. Non-Lebanese pharmacy students might have also taken part. The snowball technique used to collect the data is a nonrandom technique that may result in a bias in selection. Moreover, no professional medical evaluation was performed to screen for participants who may have had a pre-existing mental illness. The fact that the majority of the participants were female may have influenced the final assessment. Some participants complained about the questionnaire length, which might have negatively affected the quality of the answers. In addition, the study lasted only two months, which limits generalisability. Residual confounding bias is also possible since local factors were not assessed, which might have impacted the students' responses. Due to the length of the study, no open-ended questions were included, when their addition would have allowed the researchers to gather in-depth information about a topic or generate new research ideas, hence the importance of qualitative research to understand the opinions or experiences of students in more depth.

## Conclusion

This study has shed light on the gaps in the literature concerning the mental health of Lebanese pharmacy students after the intense times of COVID-19, showing high levels of insomnia, depression, anxiety, and PTSD, even months after ending COVID-19 lockdowns. The mental health of these students was influenced by gender, school year, online studying and training, monthly income, and financial status. Our study can help university policymakers assess whether interventions are needed to support the mental health of pharmacy students during future pandemics. It also suggests the need for educating students about psychological health and shows the importance of focusing on their well-

being rather than their academic performance only. Moreover, it highlights the need for faculty and educators to take action and shift their efforts towards students to initiate good communication with and adjust to their academic and personal needs in light of upcoming pandemics. In the future, faculty members and educators can hold campaigns that promote mental health therapy benefits and how one can get the support they need from such interventions. Educators should also normalise talking about mental distress rather than stigmatising it and emphasise how one should seek help before these distresses progress. These actions would give pharmacy students more education and insight into why therapy is beneficial and make them hold responsibility towards educating their environment in their future careers.

Finally, further studies with a large sample are needed to determine if these psychiatric symptoms persist today and negatively affect the mental state of students to be able to generalize them to foreign countries, especially neighbouring regions.

## Conflict of interest

The authors declare no conflict of interest.

## Source of funding

The authors did not receive any funding.

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