



Investigation of Anxiety among Pharmacy Students during the COVID-19 Pandemic in Northern Cyprus

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Abstract

Background: Anxiety is common among university students and previous research has highlighted the association between the COVID-19 pandemic and higher anxiety scores in the public.

Objectives: In this regard, this study aimed to evaluate the effect of the COVID-19 pandemic on the anxiety status of pharmacy students studying in Northern Cyprus and analyze the role of some parameters on the observed anxiety scores.

Methods: Anxiety scores of 185 pharmacy students studying at two universities in Northern Cyprus were evaluated using Beck Anxiety Inventory (BAI) and Generalized Anxiety Disorder-7 (GAD-7) assessments. Additionally, the information of participants was recorded in terms of sociodemographic and educational characteristics, antidepressants and anxiolytic use, and consumption of vitamin-mineral supplements. The questionnaires were distributed during the COVID-19 pandemic from December 11, 2020, to January 4, 2021, online via the Microsoft Teams® platform. It should be mentioned that responses were anonymous.

Results: The mean BAI and GAD-7 scores of pharmacy students were 13.1 ± 11.2 and 10 ± 6.7 , respectively. Based on the results, 6% of the students (n=11) revealed potentially concerning levels of anxiety in their BAI responses. Moreover, 31.9% of the pharmacy students (n=59) demonstrated severe anxiety scores on the GAD-7. Positive COVID-19 cases in the family led to statistically significant increases in anxiety on both instruments. Pharmacy students with five years of education (B.Pharm/M.Pharm) showed significantly higher anxiety scores on the BAI. Besides, age correlated negatively with anxiety scores on the GAD-7. Neither antidepressant and anxiolytic use nor vitamin/mineral supplement use were not related to the anxiety scores of participants.

Conclusion: Results of this study demonstrated an alarming anxiety status among pharmacy students during the COVID-19 pandemic period. Diagnosis of a family member with COVID-19 was observed to be critical in triggering the anxiety of pharmacy students. Data from this study should raise awareness to take action plans for the mental well-being of pharmacy students during pandemics.

Keywords: Anxiety, COVID-19, Pharmacy, Students

1. Background

Anxiety, as an important mental health parameter (1, 2), has been found to be common among university students (3, 4). Health sciences students, in particular, are prone to mental health disorders (4, 5). In a cross-sectional study, Samreen et al. found that half of the pharmacy students at a Saudi Arabian university suffered from anxiety (6). Moreover, results of previous studies, conducted during the COVID-19 pandemic period, demonstrated that specific conditions, such as isolation, employment in health care, or misinformation, lead to adverse psychological effects (8-10). Assessed by validated methods, it has been shown that specifically COVID-19 pandemic period was associated with higher levels of anxiety in the public (11, 12). Mental health of university students was also affected by the COVID-19 pandemic (13-15). A steady increase in anxiety occurred among university students during

the first days of the lockdown in Greece (16).

The first COVID-19 case was detected in Northern Cyprus on March 9, 2020. Shortly afterward, the first restrictions were enacted. Following the World Health Organization pandemic declaration, on March 16, flights and ships to the island were canceled and then allowed on a reduced and regulated schedule. Visitors to Northern Cyprus were required to stay in hotel quarantine for one to two weeks and universities suspended instruction in Northern Cyprus for 3 weeks. Classes then continued online until further notice (17). To this date, full or partial curfews have been enforced on the island. Curfews, lockdowns, and intermittent isolations occur, and education continues online in Northern Cyprus.

Pharmacy faculties in Northern Cyprus host students from different countries. Therefore, it provides a suitable environment to study the impact of the COVID-19 outbreak on students at an international level. The present study is the first to

our knowledge to evaluate the effects of the pandemic on the anxiety levels of international pharmacy students using two different assessments and examine the impact of various factors on their anxiety status.

2. Objectives

This study mainly aimed to investigate the anxiety levels of pharmacy students in Northern Cyprus during the COVID-19 outbreak. In addition, it aimed to analyze the impact of some sociodemographic and educational characteristics as well as the use of particular medications for the management of anxiety.

3. Methods

3.1. Study Design

This observational-descriptive study was performed between December 11, 2020, and January 4, 2021, in the pharmacy faculties of Eastern Mediterranean University (EMU) and Cyprus International University (CIU) in Northern Cyprus. Each university provides two different undergraduate programs, namely Bachelor of Pharmacy (B.Pharm., EMU)/Master of Pharmacy (M.Pharm., CIU) and Pharm.D. (Doctor of Pharmacy, EMU & CIU), lasting 10 and 12 semesters, respectively.

After the Research and Publication Ethics Boards of the two universities (CIU No: 20/01/2021/100/999 and EMU no: ETK00-2021-0077) approved the study, participants were asked to respond to the questionnaires about their situation and mood during the pandemic. The questionnaire was prepared using Google Forms® and delivered to the participants online via the Microsoft Teams® platform. Since the instructional language was English for all students participating in the study, the whole form was written in English. Responses were collected online anonymously.

3.2. Participants

Participants were selected from the pharmacy faculties of EMU and CIU in Northern Cyprus. In total, 250 pharmacy students (150 from EMU and 100 from CIU) were randomly selected by using a simple randomization method among all the pharmacy students registered in these two pharmacy faculties. The sample size was calculated with a 0.4 effect size and 95% confidence interval according to the total number of registered pharmacy students in the two universities during the period of the study.

The inclusion criteria were to have an active registration in these programs between March 9, 2020 (when the first COVID-19 case was detected in Northern Cyprus) and the time they were invited to respond to the anxiety assessment tools and agreed

to answer the questionnaires. Participants who spent more than half of the study period (between March 9, 2020, and the time they were invited to answer the questionnaires) in another faculty or university were not included in this study.

3.3. Questionnaires

Each respondent completed a questionnaire that comprised three sections. The first section included 42 items covering their sociodemographic, educational characteristics, and use of antidepressants and anxiolytics (Anatomical Therapeutic Chemical (ATC) code: N06A and N05B) and vitamin/mineral supplements (ATC code: A11, A12, and A16). The second and third sections consisted of validated anxiety assessment tools, namely the Beck Anxiety Inventory (BAI), and Generalized Anxiety Disorder-7 (GAD-7).

The BAI is a 21-item self-report inventory for the assessment of anxiety severity. It has good internal consistency (Cronbach $\alpha=0.92$) and its test-retest reliability over 1 week is 0.75 (18). All items are scored from 0 to 3 (0: not at all, 1: mildly, but it did not bother me much, 2: moderately, it was not pleasant at times, and 3: severely, it bothered me a lot (18). The total score is the sum of the score of all 21 items. Scores of 0-21, 22-35, and 36 or higher indicated low, moderate, and elevated (potentially concerning) anxiety levels, respectively (19). When the cut-off value is set at 22 points for the BAI, scores equal and above are interpreted as moderate to potentially concerning anxiety levels.

The GAD-7 is a seven-item tool with established validity for screening generalized anxiety disorder and other disorders with a Cronbach alpha of 0.92 and test-retest reliability of 0.83. Each item is scored from 0 (not at all) to 3 (nearly every day). Total scores of 5, 10, and 15 are set as cut-off points for mild, moderate, and severe anxiety levels, respectively. Scores equal to or greater than 10 represent an appropriate cut-off point for identifying generalized anxiety disorder cases where the sensitivity and specificity for GAD are determined to be 89% and 82%, respectively (20).

3.4. Statistical Analysis

The SPSS® software (version 22.0) was used for data analyses. Descriptive statistics were calculated to determine the anxiety scores of pharmacy students obtained by both assessment tools. An independent samples t-test and one-way analysis of variance were performed to evaluate the anxiety scores of participants according to the sociodemographic parameters and drug-use variables. Pearson correlation analysis results described the relationships among age, cumulative grade point average (cGPA), and anxiety scores as well as the association between the BAI and GAD-7. Tukey post-hoc testing was performed to investigate which

groups differed significantly. It should be mentioned that a p-value of less than 0.05 was considered statistically significant.

4. Results

This study included 185 pharmacy students (116 from EMU and 69 from CIU). The response rates to the questionnaires were 77.3% and 46% for EMU and CIU students, respectively. Moreover, the mean age of the participants was 22.9 ± 2.4 (min: 18, max: 31). There were slightly more female (n=103, 55.7%) than male students (n=82, 44.3%) in our sample. In addition, 53% of participants were from Turkey or Northern Cyprus, and 47% were from other countries (Iran, Nigeria, Zimbabwe, Syria, Jordan, Lebanon, Morocco, and Iraq). Only 33.5% of the participants resided in Northern Cyprus, and other participants were internationally based (43.2% in Turkey and 23.2% in other countries) during the study.

Regarding the educational characteristics of the participants, it has been observed that approximately 58% and 42% of the participants were registered in the B.Pharm./M.Pharm. and Pharm.D. programs, respectively. The mean cGPA of the participants was 2.6 ± 0.5 (min: 1.25, max: 4.00) out of 4.00. Approximately, 69% of the participants were in the third, fourth, and fifth years of their programs. Most of the students (88.1%) did not have a parent who was more than 65 years old and approximately 36% of the participants declared that they had a COVID-19-positive case in their family.

The BAI and GAD-7 scores of the participants were 13.1 ± 11.2 (min:0, max: 48) and 10 ± 6.7 (min: 0, max: 21), respectively. Anxiety scores of 36 students (19.5%) in BAI and 101 students (54.6%) in GAD-7 were equal to or higher than the cut-off values, where the cut-off values were 22 (moderate to potentially serious anxiety levels) and 10 (moderate to severe anxiety levels) for BAI and GAD-7, respectively. Mean anxiety score of the participants with potentially concerning anxiety (6% of the students) was 39.8 ± 3.3 (min: 36, max: 48) on BAI. Moreover, the mean score of participants with severe anxiety levels (31.9% of the students) was 17.3 ± 2.1 (min:15, max: 21) assessed by the GAD-7

tool (Table 1). Although not statistically significant, female students had slightly higher anxiety scores than males in both assessment tools.

Anxiety scores were observed to be significantly higher on the BAI ($P < .05$) among students studying for 10 semesters in the undergraduate pharmacy program (B.Pharm./M.Pharm.). But it should be noted that their GAD-7 score was not significant. Anxiety scores did not significantly differ according to their study years in both tools; however, anxiety scores of the freshman pharmacy students were slightly higher, compared to the other academic years.

The anxiety scores of the students whose hometown is in Turkey or Northern Cyprus were observed not to be significantly different from others in both anxiety assessment tools. Living alone or together (with family or roommates) during the COVID-19 pandemic did not significantly affect the anxiety status of pharmacy students. However, students who had a parent above 65 years old showed higher anxiety scores on both tools, although it was not statistically significant. In addition, the existence of COVID-19-positive cases in the family increased the anxiety scores of the participants significantly (BAI [$P < .01$] and GAD-7 [$P < .01$]). (Table 2).

There was a significant ($P < .01$) and positive ($r = 0.57$) correlation between the GAD-7 and BAI. Moreover, a statistically significant, negative correlation was observed between age and the GAD-7 assessment ($P = .02$ and $r = -0.17$). However, age was not significantly correlated with BAI ($P = .26$ and $r = -0.08$). Statistical analysis did not reveal a significant correlation between cGPA and the anxiety tools ($P > .05$ and $r = -0.07$ for BAI and $P > .05$ and $r = -0.08$ for GAD-7).

Regarding medication use, 15 students declared that they were using an antidepressant and/or anxiolytic drug during the study. Moreover, it is noteworthy that 12 students started these medications during the pandemic period. In addition, 61 students reported using a vitamin/mineral supplement during the study, 34 of whom (55.4%) started these supplements during the pandemic period. Neither using an antidepressant and/or anxiolytic, nor a vitamin/mineral supplement had a significant correlation with the anxiety scores on both assessments (Table 3).

Table 1. Anxiety scores of pharmacy students during the COVID-19 pandemic period

	All Students N=185	Percentage (%)	Mean±SD
Beck Anxiety Inventory			
Low	149	80.5	8.7±6.7
Moderate	25	13.5	27.4±4.6
Potentially Concerning	11	6	39.8±3.3
Generalized Anxiety Disorder-7			
None	50	27	1.0±1.5
Mild	34	18.4	7.5±1.5
Moderate	42	22.7	12.3±1.2
Severe	59	31.9	17.3±2.1

Beck Anxiety Inventory: 0-21=low, 22-35=moderate and 36 and above=potentially concerning levels of anxiety (cut-off value=22)

Generalized Anxiety Disorder-7: 0-4=none, 5-9=mild, 10-14=moderate, 15-21=severe levels of anxiety (existence of anxiety: scores≥5 and cut-off value=10)

Table 2. Sociodemographic, educational characteristics and anxiety scores of pharmacy students during the COVID-19 pandemic period (N=185)

	BAI Score		GAD-7 Score	
	Mean±SD	P value	Mean±SD	p-value
Gender				
Female (n=103)	14.4±11.4	0.077*	10.7±6.5	0.126*
Male (n=82)	11.5±10.8		9.1±6.7	
Hometown				
Turkey&North Cyprus (n=98)	14.2±11.4	0.175*	10.2±6.4	0.571*
Other (n=87)	11.9±11.0		9.7±6.9	
Parents aged ≥65				
Yes (n=22)	17.1±13.5	0.072*	12.2±6.9	0.090*
No (n=163)	12.6±10.8		9.7±6.6	
COVID-19 (+) case in the family				
Yes (n=66)	16.6±11.8	0.001*	12.6±5.6	<0.001*
No (n=119)	11.2±10.4		8.5±6.5	
Living situation during the pandemic period				
Alone (n=88)	12.7±11.9	0.642*	9.5±6.8	0.313*
With someone else (n=97)	13.5±10.6		10.5±6.5	
Pharmacy program				
5 years (B.Pharm/M.Pharm) (n=107)	14.6±11.6	0.037*	10.3±6.3	0.492*
6 Years (Pharm. D.) (n=78)	11.1±10.4		9.6±7.1	
Current study year				
Year 1 (n=17)	16.2±9.4	0.832**	12.8±5.7	0.074**
Year 2 (n=19)	12.2±13.8		7.4±6.1	
Year 3 (n=39)	13.5±12.3		10.8±6.9	
Year 4 (n=41)	12.4±9.6		11.1±6.6	
Year 5 (n=48)	13.3±10.8		9.2±6.8	
Year 6 (n=21)	11.9±10.4		8.1±6.1	

BAI: Beck Anxiety Inventory; GAD-7: Generalized Anxiety Disorder-7

* Independent samples t-test, ** Analysis of variance test

Table 3. Medication use characteristics and anxiety scores of pharmacy students (N=185)

	BAI Score		GAD-7 Score	
	Mean±SD	p-value	Mean±SD	p-value
AD/Anx/AD+Anx				
Non-users (n=109)	15.6±9.4	0.235	11.3±6.1	0.436
Users (n=15)	12±11.3		9.9±6.7	
Vitamin/Mineral supplements				
Non-users (n=109)	12.8±11.5	0.593	10.9±6.5	0.204
Users (n=61)	13.7±10.6		9.5±6.7	

BAI: Beck Anxiety Inventory; GAD-7: Generalized Anxiety Disorder-7

AD/Anx/AD+Anx: Students who are using antidepressants or anxiolytics or both of them

5. Discussion

To our knowledge, this study is the first which evaluated the effect of the COVID-19 pandemic on the anxiety levels of pharmacy students by using two assessment tools. We also examined the impact of various factors on the anxiety status of pharmacy students during the studied period.

The results revealed anxiety prevalence among the participants based on BAI and GAD-7 tools. It was also found that the anxiety scores of the female pharmacy students were slightly higher than those of male students. Another important finding of the present study was that the existence of a family member with COVID-19 infection increased the anxiety levels of the pharmacy students. The results also showed that 31.9% of the participants suffered from severe anxiety based on the GAD-7 assessment tool. Additionally, anxiety scores of approximately

20% and 50% of the students were equal to or higher than the cut-off values determined for BAI and GAD-7, respectively.

Based on a previous study, when the GAD-7 test score indicates severe anxiety, the symptoms of patients interfere with their usual daily activities for an average of 16.8 days and may require 2.4 physician visits over three months (20). In this condition, a possible need for medication can be considered. In the present study, scores of 31.9% of the students indicated severe anxiety on the GAD-7, which could indicate a dire clinical condition.

Previous reports have demonstrated increased stress and anxiety levels among college students during the pandemic (14, 21). Consistent with these reports, Olaimat et al. found that daily life for approximately 90% of university students was disturbed by COVID-19 (22). These findings lead us to the conclusion that the mental health of pharmacy

students in Northern Cyprus has been adversely affected during the pandemic.

Anxiety scores and the percentage of pharmacy students with severe anxiety were higher, compared to other students in other pandemic studies, particularly when assessed with the GAD-7 (14, 23, 24). Participants in previous studies were college/university students from different disciplines instead of exclusively pharmacy discipline. Respondents were quarantined at home or subjected to general quarantine. Moreover, the study periods of previous research were from February to May (14, 23, 24), earlier than the period of the present research. Therefore, these differences can explain the variations described above.

It should also be noted that there was limited data for the assessment of the anxiety status of pharmacy students during the pandemic, while a considerable amount of data was available on university students in general. For example, in a study performed on pharmacy students, 38.5% of the students reported feeling nervous or anxious "always" or "frequently." However, the study did not use a validated anxiety status instrument (25). Nevertheless, the data of the present study revealed higher anxiety scores, compared to previous studies conducted on pharmacy students pre-COVID-19 (7, 26).

Results of a study carried out by Fischbein et al. showed that the mean anxiety score of 159 pharmacy students responding to the GAD-7 was 5.8, and 21% of the participants were at or above the clinical threshold (cut-off ≥ 10) (26). However, in the present study, the mean anxiety score of 159 pharmacy students responding to the GAD-7 was 10 and 54.6% of the participants were at or above the clinical threshold. Similarly, in a study performed on 170 pharmacy students, the GAD-7 revealed that 49% of them were experiencing anxiety, and 23% of them suffered from moderate and severe levels of anxiety (7). In the present study, 73% of the pharmacy students reported anxiety, and 54.6% had moderate to severe anxiety symptoms using the same assessment tool. From this perspective, it can be concluded that COVID-19 had a sizeable impact on the anxiety of pharmacy students.

Although it was not statistically significant, our data suggest slightly higher mean anxiety scores in female pharmacy students. Studies in different populations during the pandemic showed that female participants had higher anxiety scores, compared to males (12, 27, 28). In a study conducted among university students, female students were more likely than males to worry about suffering from COVID-19 (22). These findings are consistent with those of the present study. There are also similar results showing higher anxiety levels in females, compared to males among university students based on the GAD-7 scores (29, 30). Additionally, anxiety scores were found to be

elevated, especially in female pharmacy students, in a study conducted before the pandemic (31).

Results of the present study did not indicate a significant difference between the anxiety scores of students from Turkey/Northern Cyprus (whose native languages were Turkish) and those from other countries. In this research, it was observed that fluency in the native language of the country in an international university environment and English-medium faculty did not affect the anxiety scores during the pandemic period in Northern Cyprus. The B.Pharm and M.Pharm. degree programs in Turkey host many students from Turkey and Northern Cyprus, while the Pharm.D. program is populated by international students.

A notable finding of this study was that the BAI revealed significantly lower anxiety scores in students studying for the Pharm.D degree. This reduction in anxiety levels could be due to the ability of international students to return home when the transition to online education was announced. The decrease in accommodation fees and daily expenses and spending additional time with their families during the pandemic might have positively affected the anxiety statuses of these students (15). Despite the fact that previous studies demonstrated a negative correlation between GPA (widely regarded as a measure of academic success) and anxiety levels (32, 33), no significant correlation was found between cGPA and the BAI or GAD-7 assessments in the present study.

Results of the present study also showed that the year of study of pharmacy students did not play a significant role in determining the anxiety scores of the students on both assessment instruments. Nevertheless, freshman students exhibited slightly higher anxiety scores than those who were closer to graduation. Moreover, the GAD-7 revealed a significant negative relationship between age and anxiety score, reflecting the aforementioned difference.

A growing body of evidence supports the need for awareness of the vulnerable psychological health of freshman students (34) and studies show slightly higher anxiety scores in first/second-year students, and sophomores (35, 36). Additionally, Naser et al. determined that anxiety scores on the GAD-7 tended to decrease slightly in the later years of school during the pandemic; however, this finding was not statistically significant (29). Therefore, it can be concluded that first-year students require more attention than those in the later years of study.

One of the critical findings of the present research was that having a family member infected with COVID-19 increased the anxiety levels of pharmacy students. This is in line with the findings of previous studies performed on the general population (28) and the students (30). In this regard, we also observed that if the participant had a parent who was 65 years

old or above, they had higher anxiety scores; nevertheless, this finding was not statistically significant. As the fatality risk of COVID-19 infection increases dramatically in older patients, it is not a surprising finding (37).

In the present study, 15 students declared that they were using antidepressants or anxiolytic drugs. Statistical analysis revealed that using an antidepressant or anxiolytic drug did not affect the anxiety scores in both tests. Hence, further studies with large groups are needed to clarify those results due to our small sample size. Nevertheless, regardless of sample size, the fact that 12 out of 15 pharmacy students used antidepressants or anxiolytics suggests a need for professional support for the prevention or intervention of depression and anxiety disorders during the pandemic. It highlights a serious situation that requires precautionary measures.

Similarly, using a vitamin/mineral supplement did not change the anxiety scores of participants. However, 55.4% of the vitamin/mineral users started to use these supplements during the pandemic period. This finding should be further examined as it may relate to the growing literature on the possible beneficial effects of vitamin/mineral supplements to boost the immune system. These supplements could attenuate the severity of COVID-19 complications and are potential candidates for adjunctive therapies in standard treatment protocols (38, 39).

The present study had some limitations, such as its small sample size and the conduction of the surveys during a relatively late phase of the pandemic. Nevertheless, the results indicated a need for attention to the psychological well-being of pharmacy students, considering the high prevalence of serious anxiety during the pandemic. The findings of the present research can provide data for future research and literature meta-analyses.

6. Conclusion

This study revealed high anxiety scores among pharmacy students during the COVID-19 pandemic period. The required data were collected through two validated assessment tools to increase the power of the obtained results and enable comparisons with the previous studies. Additionally, due to the international nature of the university, we could find the opportunity to conduct research among students from different countries.

This study raises awareness among faculty, staff, and school administrators involved in planning strategies (e.g., organizing online or face-to-face courses, discussions, workshops, and social activities, and adding stress management workshops and mental health materials to the pharmacy curriculum).

These findings also support the need for accessible, readily available psychological counseling

centers on campuses, especially in multicultural environments. Action plans addressing the well-being and continuous delivery of high-quality education to future pharmacists should be ready in case similar pandemic conditions arise. Finally, the education of pharmacy students about coping strategies to minimize anxiety and stress will have benefits for the entire profession. It will make them competent in their future professional lives to assist patients facing these health challenges.

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Footnotes

Conflicts of Interest: None to declare.

Authors' Contributions: Emre Hamurtekin: Conceptualization and methodology, Data collection, Data analysis and interpretation, Drafting the article, Revising and final approval of the manuscript
Ahmet Sami Boşnak: Conceptualization and methodology, Data analysis and interpretation, Drafting the article, Revising and final approval of the manuscript

Forouzandeh Farhoumand: Conceptualization and methodology, Data collection, Data analysis and interpretation, Drafting the article

Azadeh Mohebali: Conceptualization and methodology, Data collection, Data analysis and interpretation

Ayşegül Kaymak Özdemir: Conceptualization and methodology, Drafting the article, Revising and final approval of the manuscript

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