ANXIETY AND DEPRESSION AMONG U.S. INTERNATIONAL STUDENTS DURING THE COVID-19 PANDEMIC

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The COVID-19 pandemic has impacted college students worldwide. International students are a significant group of college students in the United States, making up approximately 5% of enrollment. While research has examined the mental health effects of the COVID-19 pandemic on college students, its impact on international students in the U.S. has not been well-documented. This study examined anxiety and depression levels of 170 international students enrolled in three public U.S. universities. Data were collected using the Generalized Anxiety Disorder (GAD-7) survey and the Patient Health Questionnaire (PHQ-9). Over 60% of the sample reported anxiety and depressive symptoms, with 35.1% showing moderate-to-severe anxiety and 32.9% moderate-to-severe depression. Both anxiety and depression were significantly higher among students with a previous history of mental health illness and those with a colleague who contracted COVID-19. In addition, depression was significantly higher for unmarried students. In addition to these significant differences, the prevalence of moderate-to-severe depression and anxiety levels was observed for female students and unmarried or had a family member who contracted the virus.

Keywords: COVID-19 pandemic, international students, mental health, anxiety, depression, GAD-7, PHQ-9

Introduction

In December 2019, a rapidly spreading virus causing pneumonia-like symptoms, later named COVID-19, began to spread worldwide. The World Health Organization (WHO) declared it a global pandemic on March 11, 2020 (WHO, 2020). By September 30, 2021, the virus had infected more than 233 million people and killed nearly 5 million worldwide (John Hopkins University and Medicine, 2021). Reduction of its spread required unusual disruptions to life, including lockdown/quarantine, working from home, social isolation, home-schooling of children, travel restrictions, testing, screening, and contract tracing, all of which imposed a significant negative psychological impact on people worldwide (Bao et al., 2020; Koushik, 2020; Lima et al., 2020; Li et al., 2020; Shigemura et al., 2020; Wang et al., 2020). Additionally, the mass shutdown of industries and financial organizations added stress and anxiety (Kawohl & Nordt, 2020). Czeisler et al. (2020) reported that a significantly higher number of U.S. adults reported anxiety (25.5% versus 8.1%) and depression (24.3% versus 6.5%) in the second quarter of 2020 compared to the second quarter of 2019.

U.S. college students have been identified as a vulnerable group for mental distress during the COVID-19 pandemic (Dachew et al., 2019; Knowlden et al., 2016; Lee, 2020). Prior to the pandemic, the American College Health Association (2018) reported that 30-50% of U.S. college students were diagnosed or treated for at least one psychiatric disorder, and mental illness has worsened as the pandemic evolved (Koushik, 2020). with significant increases in anxiety, depression, PTSD, and stress disorder (Amerio, et al., 2020; Bao et al., 2020; Islam et al., 2020; Kaparounaki et al., 2020; Kecojevic et al., 2020; Khan, et al., 2020; Patsali et al., 2020; Son et al., 2020; Tang et al., 2020).

International students, those with temporary non-immigrant student visas enrolled in post-secondary institutions (Stevens et al., 2009), are a significant portion of U.S. college students, representing 5.5% of the student population (Institute of International Education [IIE], 2021). Globalization and internationalization of the world have accelerated the entrance of international students in the U.S. (Altbach et al., 2007), with the number of international students increasing considerably in the last decade (IIE, 2021). International students and their dependents contributed more than $38.7 billion to the U.S. economy and nearly 415,996 jobs in the 2019-20 academic year (National Association of Foreign Student Advisor [NAFSA], 2021a). Their presence on U.S. campuses contributes to globalization and cultural diversity, enhances curriculum development, and facilitates a relationship between the U.S. and students' home countries (NAFSA, 2021b).

Recommendations for enhancing research on the pandemic include examining its psychological impact on various populations (Galea et al., 2020; Liu et al., 2020), including international students from different ethnicities and backgrounds (Pham & Shi, 2020). Therefore, the primary objective of this study was to examine depression and anxiety among international students from various countries during the COVID-19 pandemic. To the best of our knowledge, the current study is the first to examine this topic. We collected survey data from international students attending three public U.S. universities, gathering demographic characteristics and measuring anxiety and depression using standard scales. Analysis of data reports overall depression and anxiety levels and compares anxiety and depression among students varying in demographic characteristics (sex, marital status, financial aid funding), previous diagnosis of mental illness, and experiences with family or colleagues contracting the virus.

Methods

Sample

Participants in this study were 170 international students enrolled during the 2020-2021 academic year in three comprehensive universities in the southern US. All three universities offer various undergraduate and graduate programs and represent differing Carnegie classifications (The Trustees of Indiana University, 2017). One is a "High Research Activity Institution" with a total Fall 2020 enrollment over 16,450, including 461 international students from 77 countries. The second institution is classified as a "Doctoral/Professional University," enrolling 16,604 students during the Fall 2020 semester, of which 316 were international students. The third institution is classified as a "Master's College & University: Larger Programs," with a total enrollment of 14,461, of which 175 were international students.

Data Collection Procedures

Data were collected using an online survey designed for the study. After receiving approval from the Institutional Review Board of the respective institutions, and with the cooperation of the universities' international offices, all enrolled international students were contacted via email and social media and provided a brief description of the study and a link to the survey. Students were assured of anonymity and informed their participation was voluntary. Data were collected during a span of seven weeks, from November 23, 2020, to January 11, 2021. The survey was sent to 964 international students; a total of 170 (18%) completed surveys were collected and used for data analysis.

Instrument

Demographics and COVID-19 related items. The first section of the survey sought demographic characteristics of participants, and COVID-19 infection and mental health history. Demographic items included age, country of origin, duration abroad, institution name, classification, major, marital status, living status (individual or with family), and information about financial aid. On a single question, respondents indicated if they had a history of mental illness (depression, anxiety, PTSD, etc.). Three items addressed whether the participant had contracted COVID-19, had at least one family member who contracted COVID-19, and had at least one colleague (classmate, roommate, labmate, instructor, friend) who had contracted the virus.

Generalized Anxiety Disorder-7 (GAD-7). The second part of the survey was composed of questions from the Generalized Anxiety Disorder 7-item scale (GAD-7; Spitzer et al., 2006), a validated instrument widely used in mental healthcare settings to measure anxiety. The GAD-7 contains seven questions related to anxiety disorder symptoms, for example, "Feeling nervous, anxious, or on edge" and "Being so restless that it is hard to sit still.". Participants rate the frequency of experiencing symptoms within the last two weeks on the scale: (0) not at all, (1) several days, (2) over half of the days, and (3) nearly every day. Item scores are summed with the total score ranging from 0 to 21. Categories of anxiety severity have been established as minimal (0-4 points), mild (5-9), moderate (10-14), and severe (15 – 21).

Patient Health Questionnaire-9 (PHQ-9). The third section contained questions from the Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001), a validated and widely used tool used to measure depression in a primary care setting. The PHQ-9 contains nine items describing depression symptoms. Example items include "Feeling bad about yourself or that you are a failure or have let yourself or your family down" and "Little interest or pleasure in doing things." Participants rate the frequency of experiencing

symptoms within the last two weeks using the options: (0) not at all, (1) several days, (2) over half of the days, and (3) nearly every day. Item scores are summed with a possible range from 0 to 27. Categories of depression severity are indicated as minimal (0-4), mild (5-9), moderate (10-14), moderately severe (15 – 19), and severe (20 – 27).

Data Analysis

Mean anxiety and depression scores were calculated, and the frequency and percent of respondents varying levels determined. Differences in anxiety and depression scores were compared among demographic groups (sex, marital status, financial aid funding), previous mental illness, and COVID-19 experiences using t-tests. For these comparisons, Cohen's d (Cohen, 1988) was calculated as a measure of effect size. Additionally, the frequency and percent of respondents displaying varying levels of anxiety and depression within groups were determined, and the odds ratio (OR) was calculated indicating the relative percentage increase or decrease in one group compared to another reporting moderate-to-severe levels. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) and STATA 14.

Results

Characteristics of the Sample

Among the 170 respondents, 83 (48.8%) were female, and 87 (51.2%) were male. More than half (n=97, 57.1%) were between 18 and 25 years old, and 48 (28.2%) were 26-29 years of age. Students were from 52 countries representing all six classified regions of the WHO (2021), with the greatest numbers from Southeast Asia (n=70, 41.2%) and European regions (n=33, 19.4%). Slightly more than half (n=96, 56.4%) were pursuing graduate degrees. Participants were pursuing degrees from a variety of academic areas, with the greatest numbers in science (n=51, 20.4%), engineering (n=42, 16.8%), and business (n=24, 9.6%). The majority of students (n=130, 76.5%) were living in the U.S. without their families, and most (n=138, 81.2%) were unmarried. Nearly half of respondents (n=84, 49.4%) had financial aid with a full tuition waiver, and 63.5% (n=108) reported having an on-campus graduate assistant position.

At the time of data collection, very few students (n=16, 9.4%) had been diagnosed with COVID-19. Slightly over 20% (n=41, 24.1%) reported having at least one family member who contracted COVID-19, and 93 (54.7%) indicated having at least one colleague who contracted the virus. Slightly more than 15% of students (n=29, 17.1%) indicated having been diagnosed with a mental health illness before the COVID-19 pandemic.

Anxiety

Anxiety, as indicated by GAD-7 scores, is reported for the entire sample and for demographic groups in Table 1. For comparisons of anxiety between demographic groups, mean GAD-7 scores are indicated along with effect size (Cohen's d), plus the OR reflecting the relative likelihood of having moderate-to-severe anxiety. Mean anxiety scores for selected comparison groups are also displayed in Figure 1.

Approximately two-thirds (63.5%) of all participants reported some level of anxiety, with 29.4% categorized as experiencing mild anxiety, 22.7% moderate, and 12.4% severe anxiety. Students who reported prior mental illness had, on average, significantly higher anxiety scores than those without a previous mental illness diagnosis [$t(168)=3.06$, $p=.003$], and were 2.65 times more likely to have moderate-to-severe anxiety levels. Additionally, students who had a colleague who contracted COVID-19 had significantly higher mean anxiety

Table 1. Anxiety (GAD-7 Scores) for the Sample and Comparison Groups

	n	Mean (SD)	Cohen's d	Anxiety Level				OR
				Minimal n (%)	Mild n (%)	Moderate n (%)	Severe n (%)	
Entire sample	170	7.42 (5.64)		62 (36.5)	50 (29.4)	37 (21.7)	21 (12.4)	
Sex								
Female	83	8.25 (5.85)	.29	28 (33.7)	20 (24.1)	22 (26.5)	13 (15.7)	2.03
Male	87	6.62 (5.35)		34 (39.1)	30 (34.5)	15 (17.2)	8 (9.2)	
Marital status								
Unmarried	138	7.63 (5.73)	.27	50 (36.2)	39 (28.3)	29 (21.0)	20 (14.5)	1.73
Married	29	6.14 (5.28)		12 (41.4)	10 (34.5)	6 (20.7)	1 (3.4)	
Assistantship								
No	62	7.90 (6.10)	.13	21 (33.9)	17 (27.4)	15 (24.2)	9 (14.5)	1.37
Yes	108	7.14 (5.37)		41 (38.0)	33 (30.6)	22 (20.3)	12 (11.1)	
Previous mental health diagnosis**								
Yes	26	10.46 (5.03)	.68	4 (15.3)	8 (30.8)	8 (30.8)	6 (23.1)	2.65
No	144	6.87 (5.59)		58 (40.3)	42 (29.2)	29 (20.1)	15 (10.4)	
Family member(s) contracted COVID-19								
Yes	41	7.66 (5.47)	.06	12 (29.3)	13 (31.7)	13 (31.7)	3 (7.3)	1.33
No	129	7.34 (5.71)		50 (38.7)	37 (28.7)	24(18.6)	18 (14.0)	
Colleague(s) contracted COVID-19*								
Yes	93	8.27 (5.61)	.34	29 (31.2)	28 (30.1)	20 (21.5)	16 (17.2)	1.58
No	77	6.39 (5.55)		33 (42.8)	22 (28.5)	17(22.1)	5 (6.5)	

**Groups significantly different, $p<.01$

*Groups significantly different, $p<.05$

OR: Odds-ratio indicating relative probability of having moderate-to-severe anxiety

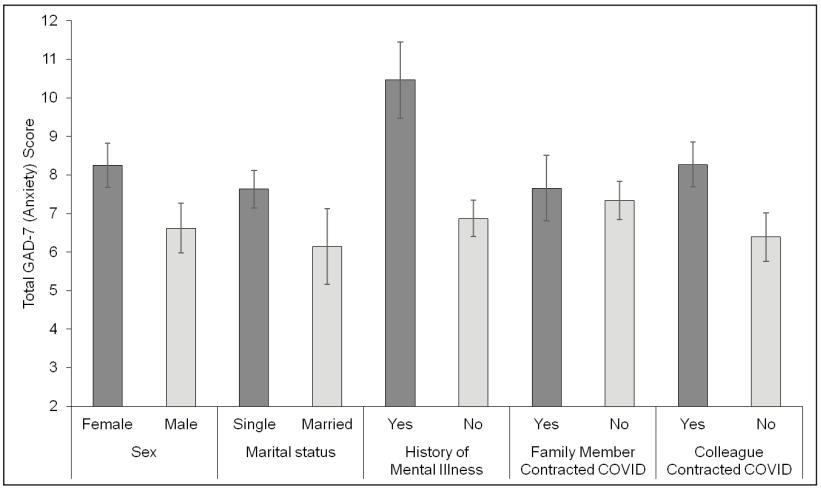

Figure 1. Framing Total GAD-7 (Anxiety) Scores for Different Groups

[t(168)=2.19, p=.03], and were 58% more likely to have moderate-to-severe anxiety. Comparison of male vs. female anxiety levels approached significance [t(168)=1.90, p=.06], with females reporting higher mean anxiety, and were over two times more likely to have moderate-to-severe anxiety levels than males. Other comparisons of mean values were not significant, however, moderate-to-severe anxiety tended to be more prevalent among unmarried students (OR=1.73), those without a graduate assistantship (OR=1.37), and those who reported having a family member who had contracted COVID-19 (OR=1.33).

Depression

Depression scores and levels, as measured by PHQ-9 scores, are reported in Table 2, and mean depression scores for selected comparisons are displayed in Figure 2. Of the total sample, 32.9% of students' scores indicated moderate-to-severe depression. Mean depression scores were significantly higher among students who reported prior mental illness [t(168)=3.54, p=.001], who were over three times more likely to have moderate-to-severe levels of depression. Additionally, depression was significantly higher among unmarried than married students [t(165)=2.08, p=.04],

Table 2. Depression (PHQ-9 Scores) for the Sample and Comparison Groups

	n	Mean (SD)	Cohen's d	Depression Level			OR
				Minimal n (%)	Mild n (%)	Moderate-to-Severe n (%)	
Entire sample	170	7.48 (6.00)		66 (38.8%)	48 (28.2%)	56 (32.9%)	
Sex							
Female	83	7.59 (6.03)	.02	31 (37.3%)	23 (27.7%)	29 (34.9%)	1.19
Male	87	7.46 (6.13)		35 (40.2%)	25 (28.7%)	27 (31.0%)	
Marital status*							
Unmarried	138	7.95 (6.15)	.44	51 (37.0%)	38 (27.5%)	54 (39.1%)	2.33
Married	29	5.38 (5.54)		15 (51.7%)	8 (27.6%)	6 (20.7%)	
Graduate Assistantship							
No	62	8.00 (6.27)	.12	21 (38.8%)	20 (32.3%)	21 (33.9%)	1.07
Yes	108	7.25 (5.95)		45 (41.7%)	28 (25.9%)	35 (32.4%)	
Previous mental health diagnosis**							
Yes	26	11.27 (5.82)	.76	4 (15.4%)	8 (30.8%)	14 (53.8%)	3.05
No	144	6.85 (5.87)		62 (43.1%)	40 (28.2%)	39 (27.1%)	
Had family member(s) who contracted COVID-19							
Yes	41	7.71 (5.90)	.04	15 (36.6%)	9 (22.0%)	17 (41.5%)	1.63
No	129	7.47 (6.13)		51 (38.8%)	39 (30.2%)	39 (30.2%)	
Had colleague(s) who contracted COVID-19							
Yes	93	8.28 (6.02)	.28	30 (32.3%)	29 (31.2%)	34 (36.6%)	1.44
No	77	6.61 (6.03)		36 (46.8%)	19 (24.7%)	22 (28.6%)	

**Groups significantly different, p<.01

*Groups significantly different, p<.05

OR: Odds-ratio indicating relative probability of having moderate-to-severe anxiety

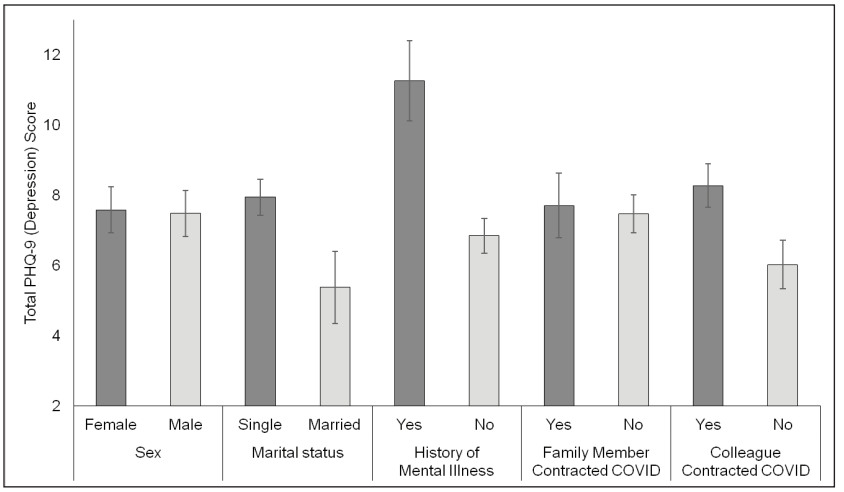

Figure 2. Framing Total PHQ-9 (Depression) Scores for Different Groups

with unmarried students 2.33 times more likely to have moderate-to-severe depression. Mean depression scores were also higher among students who reported having a colleague who contracted the virus, with the difference approaching significance [$t(168)=1.80$, $p=.07$]. Other comparisons were not statistically significant; however, mean depression values tended to be slightly higher among female students, those who had a family member or colleague who contracted COVID, and students without a graduate assistantship. These characteristics increased the odds of having moderate-to-severe depression by 7% to 44%.

Discussion

The COVID-19 pandemic caused many dramatic life changes leading to stress and changes in mental health. College students have been identified as an at-risk group during the pandemic, and research has documented an increase in mental health problems such as anxiety, depression, PTSD, and stress. However, little research has examined mental health among international students in the U.S., who, due to their international status and distance from families, may be at greater risk. The purpose of this study was to examine the anxiety and depression levels of international students studying in U.S universities.

Our data indicated approximately that two-thirds (63.5%) of all participants reported some level of anxiety, and anxiety was significantly higher among students who reported prior mental illness and those who had a colleague who contracted COVID-19. Additionally, moderate-to-severe anxiety was also more prevalent among females, unmarried students, those without a graduate assistantship, or reported having a family member who had contracted COVID-19.

With respect to depression, 32.9% of students showed evidence of moderate-to-severe depression. Depression was significantly higher among unmarried students and those who reported prior mental illness. Additionally, a moderate-to-severe level of depression was more common among students who reported having a colleague or family member who contracted the virus, females, and students without a graduate assistantship.

Previous research has documented mental health challenges during the COVID-19 pandemic among U.S. college students including lack of motivation, anxiety, stress

and isolation (Charles et al., 2021; Hoyt et al, 2021; Liu et al, 2020). Several of these survey-based investigations included questions about depression and anxiety, with many using single items. These studies reported that 30-50% of students indicated increased anxiety, and 30-40% indicated higher depression during the pandemic. Due to variations in measures of anxiety and depression between our study and those prior, direct comparisons of these data to ours cannot be made. However, the percentage of international students with moderate-to-severe levels of depression and anxiety was higher than that among the U.S. adults studied by Czeisler et al. (2020), which suggests that international students may have an increased risk for mental health issues due to the pandemic.

Our results indicated that certain subgroups of international students might be at even greater risk for mental health issues during the pandemic. These include students with prior mental health issues, unmarried students, those with a colleague or family member who contracted COVID-19, as well as female students and those without a graduate assistantship. Some of these group differences have been previously observed. Browning et al., (2021), in a survey of over 14,000 students from 7 universities and found a greater COVID-19 impact on psychological health among women and students with below-average income, and similar findings were reported by Nguyen et al. (2020) in a study of medical students in Vietnam.

In addition to adding to the scientific evidence of the mental health impact of the COVID-19 pandemic, our results have implications for university leaders and faculty. Universities should be aware that international students may be at risk of anxiety and depression during the pandemic and of the subgroups who are at greater risk. The evidence supports the development of university-based strategies to provide mental health services to international students, identifying those at higher risk for services, following national mental health guidelines of organizations such as the National Alliance on Mental Illness, the American Psychiatric Association, and the Centers for Disease Control and Prevention.

The strengths of this study are examining a varied sample of international students from several countries attending three public U.S. universities who were pursuing varied degrees, and the measurement of anxiety and depression using well-recognized scales. Limitations include those associated with sampling (i.e., all three universities are from one region of the U.S., and data were collected from students who elected to respond to the survey). The study would be strengthened if data from domestic students had also been collected, which would have allowed for comparisons among domestic and international students from the same universities, and if the survey was extended to students from universities in additional regions. Finally, the scales used to collect data were quantitative, and qualitative data would enhance understanding. All of these provide opportunities for future research and examine changes in mental health as the pandemic evolves.

This study sought to add research on mounting evidence of psychological responses during the COVID-19 pandemic among college students. To the best of our knowledge, this is the first original study on the pandemic's impact on international students in the U.S. Evidence suggests that many international students have moderate-to-high anxiety and depression levels, which are greater among specific groups of students. The data provides compelling reasons why international students with prior mental health issues, concerns about educational funding, lack of spousal support, and those with family members and colleagues who contracted the virus should be given support from their universities and communities.

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