Unmasking the psychological impact of COVID-19 among young adults (ages 18-28) during the initial global lockdown: Results from a cross-sectional online survey

Omar Shazley, Michelle Wiciak, Daphne Santhosh

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Abstract

Background: The coronavirus disease 2019 (COVID-19) pandemic impacted global mental health, especially in young adults.

Objective: This study assessed the psychological impact COVID-19 had on mental health (i.e., PTSD, anxiety, fear) in young adults ages 18 to 28 and demographic differences in this population.

Methods: Data were collected between September 2020 and January 2021 through an online survey. The survey used various questionnaires to collect information that included demographics, COVID-19-related questions (quarantine status, hospitalization history, diagnosis), depression (the 9-item Patient Health Questionnaire (PHQ-9)), anxiety (the 7-item Generalized Anxiety Disorder (GAD-7)), stress from the pandemic (Impact of Events Scale-Revised (IES-R)), and the Fear of COVID-19 Scale (FCV-19S). 183 responses were validated by inclusion/exclusion criteria. All statistical analyses were set at alpha=0.05.

Results: Over 70% of participants (n=129) had at least mild anxiety, nearly 80% of participants (n=136) had at least mild depression, almost 40% (n=61) met criteria for post-traumatic stress disorder (PTSD) from the pandemic, and nearly 50% (n=88) had a high level of fear of COVID-19. Females had higher anxiety scores ($t(173)=-3.352$, $p<.001$), depression ($t(166)=-3.310$, $p=.001$), and trauma from COVID-19 (($t(151)=-2.004$, $p=.047$) compared to males. Those who identified Hispanic/Latino/a/x had higher depression ($F(2,156)=7.761$, $p<.001$) and IES-R scores ($F(2,143)=3.999$, $p=.020$). We found that age in 2020 was associated with IES-R total scores $F(1,154)=4.230$, $p=0.041$, $R2=0.027$, adjusted $R2=0.2$. Those who were mandated a quarantine had lower anxiety ($F(2,175)=3.442$, $p=.034$) and depression ($F(2,170)=3.092$, $p=.048$) scores than those not mandated. Those who had someone close to them mandated a quarantine had lower anxiety ($t(162.184)=2.705$, $p=.008$) and IES-R scores ($t(149)=2.169$; $p=.032$) than those not mandated. Those who had someone close to them hospitalized due to a COVID-19 infection had lower anxiety scores ($t(127)=2.855$, $p=.005$), depression scores ($t(123)=3.111$, $p=.002$), and IES-R scores ($t(152)=-1.975$, $p=.050$) than those who did not have someone close to them hospitalized.

Conclusions: Overall, we found significant mental health findings with various demographic differences that need further investigation and consideration. Furthermore, we found evidence suggesting the impact of an individual's social circle on a person's health during the pandemic. We recommend continued efforts to identify risk factors in vulnerable populations from the pandemic, especially in mental health, and significant public health measures to protect these populations in the future.

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Unmasking the psychological impact of COVID-19 among young adults (ages 18-28) during the

initial global lockdown: Results from a cross-sectional online survey

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Abstract

Background: The novel SARS-CoV-2 coronavirus (COVID-19) pandemic has emerged as a public

health emergency of international concern and a formidable threat to individual psychological

resilience. Although focusing on physical symptoms from COVID-19 is essential, it is vital to recognize the elevated stress, trauma, and mental health problems, especially in young adults—a population with growing mental health concerns.

Objective: This study aims to examine the prevalence of psychological issues (depression, anxiety, stress and trauma from COVID-19, and fear of COVID-19) and identify risk factors associated with demographics, quarantine status, and household social impact among young adults (ages 18-28) worldwide during the initial phase of the pandemic.

Methods: A cross-sectional study design with convenience sampling was used. Data were collected using a self-administered online survey between September 2020 and January 2021. The online survey gathered information regarding demographic information and COVID-19-related questions (quarantine status, hospitalization history, COVID-19 diagnosis). Mental health measurements included depression (Patient Health Questionnaire (PHQ-9)), anxiety (Generalized Anxiety Disorder 7-item scale), stress from COVID-19 (Impact of Event Scale-Revised (IES-R)), and fear of COVID-19 (Fear of COVID-19 scale (FCV-19S)).

Results: 183 responses were validated by inclusion/exclusion criterion. All statistical analyses were set at alpha = 0.05. Over 70% of participants reported mild anxiety (n=129), nearly 80% mild depression (n=136), almost 40% pandemic-related PTSD (n=61), and nearly 50% high COVID-19 fear (n=88). Female respondents reported higher anxiety (t(173)=-3.352, <.001), depression (t(166)=-3.310, P=.001), and trauma from COVID-19 ((t(151)=-2.004, P=.047) levels compared to male respondents. Participants who identified as Hispanic/Latino/a/x reported higher depression (F(2,156)=7.761, P<.001) and IES-R scores (F(2,143)=3.999, P=.020). Age in 2020 was associated with IES-R total scores (F(1,154)=4.230, P=0.041, R^2=0.027). Individuals who were mandated a

quarantine were linked to lower levels of anxiety (F(2,175)=3.442, *P*=.034) and depression (F(2,170)=3.092, *P* =.048) than those not mandated. Those quarantined with close contacts were linked to lower anxiety (t(162.184)=2.705, *P* =.008) and IES-R scores (t(149)=2.169; *P*=.032). Close contacts' hospitalization due to COVID-19 infection were linked to lower anxiety scores (t(127)=2.855, *P*=.005), depression(t(123)=3.111, *P*=.002), and IES-R scores (t(152)=-1.975, *P*=.050) than those who did not have someone close to them hospitalized.

Conclusion: The findings highlight the significant effect COVID-19 had on mental health in young adults worldwide. Various demographics were associated with varying mental health outcomes, and our study also suggests there is an impact of an individual's social circle on a person's health during the pandemic. We recommend continued efforts to identify vulnerable populations from the mental health consequences of the pandemic, additional research to understand the relationship between risk factors and mental health during COVID-19 and lingering effects, and public health interventions to protect these populations in the future.

Keywords: coronavirus; COVID-19; pandemic; mental health; depression; anxiety; PTSD; young adults; students; international study; observational study; cross-sectional study

Introduction
Background

The coronavirus disease (COVID-19) pandemic presented significant changes to the general population since the World Health Organization (WHO) declared its outbreak as a global health pandemic on March 11, 2020. COVID-19 has negatively impacted both a person's physical health, as

well as their mental health. The pandemic's widespread societal disruptions (i.e., through mandated quarantines, stay-at-home measures) and subsequent socioeconomic distress exacerbated mental health struggles across various populations, especially in young adults and vulnerable populations[1–3]. Initially, the increased mental health burden was attributed to the effect of quarantine, but this may depend upon the person and their environment[4]. These mental health exacerbations are not novel to just the COVID-19 pandemic. These findings were similarly found in a 2004 study conducted after the containment of the SARS outbreak, demonstrating a notable prevalence of adverse psychological effects associated with quarantine[5]. 28.9% of respondents from this study exhibited symptoms consistent with post-traumatic stress disorder (PTSD), while 31.2% displayed depressive symptoms[5]. This study also found that extended periods of quarantine were correlated with PTSD, and direct exposure to individuals diagnosed with SARS was linked to PTSD and depression[5].

One of the most vulnerable populations to mental health issues during COVID-19 is young adults (i.e., individuals proximately aged 19-30). Previous studies have indicated that young adults have reported poorer mental health outcomes compared to other age groups during the pandemic[6]. This specific population encountered many difficulties during the pandemic, including social disruption and isolation, financial instability, and other drastic transitions[1,7]. They were also more likely to feel lonely because of quarantining and social isolation[8]. Despite widespread evidence suggesting that social isolation is linked to both medical and physical problems, research indicates there is immense complexity regarding mental health during the pandemic. Some research suggests that young adults were less likely to seek mental health treatment during the pandemic, which is why they might have experienced more negative mental health outcomes than other age groups[9–11].

Although there is robust national data regarding demographic differences in mental health during the pandemic, this information focuses on all ages as opposed to a particular age group. Thus, little data is available on demographic differences in young adults worldwide. There is much to be

explored regarding race, ethnicity, and regional locations, especially since disparities have increased during the COVID-19 pandemic. Furthermore, there is minimal research available on how a young person's social circle can impact psychological health, especially if someone close to them had COVID-19 or was hospitalized. This variable deserves an analysis because isolation and social support have affected this population. Lastly, many studies focusing on mental health during the pandemic used retrospective data collection, subject to a degree of bias[12]. Thus, collecting mental health data during the pandemic is crucial in minimizing this bias, and the timeframe during COVID-19 can provide perspective. Various time points throughout the pandemic have been associated with varying quarantine measures, and ignoring this environmental factor could distort findings. Considering temporal measures can provide additional context and insight into quarantine's impact on mental health.

Aims of this study

This study aims to examine the prevalence of psychological issues (depression, anxiety, fear of COVID-19, and stress and trauma from the pandemic) in young adults (ages 18-28) during the early time of the COVID-19 pandemic (September 2020 to January 2021), where quarantine and isolation measures were stricter. While this was a non-hypothesis-driven exploratory study, we expected severely impacted mental health on all domains (anxiety, depression, and trauma), as well as variance between demographics, quarantine status, and an individual's close social circle.

Methods
Participants and Procedure

A cross-sectional, observational study was conducted online using the SurveyMonkey platform (SurveyMonkey, San Mateo, CA). Participants were recruited through convenience sampling. The self-administered survey was disseminated on various social media platforms (i.e., Meta (formerly Facebook), LinkedIn, and X (formerly Twitter)), survey platforms (i.e., SurveyCircle, SurveySwap), and via word of mouth and school-wide emails to recruit students from the medical institution. All participants between the ages of 18 and 28 were eligible to participate in

the online survey.

Data were collected from September 2020 to January 2021. This ensured that participants were adequately exposed to social distancing and quarantine. This was to measure psychological impacts more accurately during a typical week during the pandemic. 294 respondents completed the questionnaire. Inclusion criteria required all participants to be between ages 18 and 28, speak and read the English language, could consent, and answered all three validation questions correctly within the survey. Exclusion criteria included being out of the target age range, unable to speak and read English, unable to consent, and needing to answer the validation questions correctly. 35 individuals did not meet the age range criteria, and 76 did not answer validation questions correctly. In total, 183 responses were validated by the inclusion/exclusion criteria and were eligible for data analysis.

Questionnaire

We employed a self-administered questionnaire that consisted of three parts. The first portion of the survey asked about sociodemographics, including gender, age (in 2020), ethnicity, race, student status, employment status, income, and country of residence in the six months at the survey's completion date. Respondents who were current unemployed students were instructed to select "unemployed, not looking for work" as their employment status. The second portion of the survey contained medically related questions about COVID-19, including testing, infection, hospitalization, and past or current quarantine. This section also included questions about whether someone close to them was diagnosed with a COVID-19 infection, was hospitalized, was mandated a quarantine, and died from COVID-19. The third portion of the survey included four psychological and mental health measurement scales described below.

Mental Health (Depression, Anxiety, Psychological Impact of COVID-19, Fear of COVID-19)

The Patient Health Questionnaire (PHQ-9) was used to assess depressive symptoms. The self-

report scale scores each of the nine DSM-IV criteria on a 4-point Likert scale[13].It ranges from 0 (not at all), 1 (several days), 2 (more than half the days), and 3 (nearly every day), with the total sum ranging from 0 to 27. Scores range from 0 to 27 and depression severity is defined as minimal (0-4), mild (5-9), moderate (10-14), moderately severe (15-19), and severe (20-27). Total PHQ-9 scores equal to or greater than ten (PHQ-9 scores $\geq$ 10) strongly indicate possible depression[14].

Anxiety was assessed using the Generalized Anxiety Disorder 7-item (GAD-7). The questionnaire uses a 4-point Likert scale from 0 (not at all) to 3 (nearly every day), where anxiety symptoms are designated minimum (0-4), mild (5-9), moderate (10-14), and severe (15-21)[15,16].

The psychological impact of the COVID-19 pandemic was assessed using the Impact of Events Scale-Revised (IES-R). The 22-item measure indicates potential posttraumatic stress disorder (PTSD) with a score greater than 24[17].Assessment for COVID-19 distress assessment required the calculation of the total IES-R score, which consisted of 22 items that account for intrusion (7), avoidance (8), and hyperarousal (7)[18]. The level of difficulty for each item experienced is scaled as "not at all" (0), "a little bit" (1), "moderately" (2), "quite a bit" (3), and "extremely" (4). A potential diagnosis of PTSD can be established based on the range of the calculated overall score. A score may indicate partial symptoms (24 to 32), probable PTSD diagnosis (33 to 38), and severe suppression of the immune system's functionality (equal to or greater than 39)[19,20]. The mean average for every subset (i.e., intrusion, avoidance, hyperarousal) was computed in the data analysis.

An individual's stress and fear over the COVID-19 virus were assessed using the Fear of COVID-19 Scale (FCV-19S). The questionnaire implements a Likert scale that ranges from 1 (strongly disagree) to 5 (strongly agree) to calculate a total score from 7 to 35[21].The higher the FCV-19S score, the greater the fear of COVID-19. Scores were categorized "low" or "high" based on the cut-off score[22].

Statistical Analysis

Statistical analysis was performed using SPSS version 25.0 (IBM, Armonk, NY, USA).

Participants who did not answer all the questions in a validated scaled measurement were removed from data analysis for that scored variable. Dependent variables included GAD-7 total score, GAD-7 anxiety level, PHQ-9 score, PHQ-9 depression level, IES-R total score, IES-R subscores, and IES-R potential PTSD level. Independent variables included age, gender, race, ethnicity, continent of residence, income level, relationship status, household size, COVID-19 testing and infection, quarantine status and days quarantined, whether someone close to participant tested for COVID-19, whether someone close to participant was diagnosed with COVID-19, whether someone close to participant was hospitalized due to COVID-19, whether someone close to participant died from COVID-19, and whether someone close to participant worked on the front lines during the pandemic. Descriptive statistics were reported as mean ± standard deviation and frequency (percentage). Statistical tests included chi-square analyses, Fisher's exact tests, paired student t-tests, ANOVA, Pearson correlations, and a linear regression model. Alpha was set at 0.05.

Ethics Approval

The study was approved by the Institutional Research Committee (IRC) at Saint James School of Medicine (research project #119) with adherence to the ethical standards outlined in the 1964 Helsinki Declaration and its later amendments or similar ethical guidelines established by institutional or national research committees for all procedures performed in studies involving human participants. This study was deemed a minimal risk, and risks included mental distress answering questions. In the mental health section, the survey included links to mental health support if the participants experienced distress at any time. Participants were not compensated for their time. Before taking the survey, respondents were required to consent through an electronic consent form. They had the right to refuse to participate in the research, withdraw from the study at any time, and skip or refuse to answer any questions they felt uncomfortable answering.

Results

Participant and COVID-19 Characteristics

Descriptive participant and COVID-19 characteristics are available in Tables 1 and 2.

Table 1: Summary of sociodemographic characteristics from eligible participants who completed the cross-sectional survey from September 2020 to January 2021 (N=183)

Variables		n (%), mean (SD)
Age in 2020, mean (SD)		23.43(2.54)
Gender, n (%)		
	Male	52 (28.9)
	Female	128 (71.1)
Ethnicity, n (%)		
	Hispanic or Latino/a/x	14 (8.3)
	Not Hispanic or Latino/a/x	124 (73.8)
	Other ethnicity	30 (17.9)
Race, n (%)		
	White	142 (79.8)
	Asian	25 (14.0)
	Black or African American	3 (1.7)
	Other	8 (4.5)
Continent of residence, n (%)		
	Europe	124 (67.8)
	North America	42 (23)
	Asia	11 (6.0)
	Africa	4 (2.2)
	Australia	2 (1.1)
Employment status, n (%)		
	Full-time	24 (13.2)
	Part-time	47 (25.8)
	Unemployed, not looking for work	106 (58.2)
	Other	5 (2.7)
Student, n (%)		162 (89.0)

Table 2: Summary of COVID-19 variables from eligible participants who completed the cross-sectional survey from September 2020 to January 2021 (N=183)

Variables		n (%), mean (SD)
Tested for COVID-19, n (%)		74 (40.4)
Diagnosed with COVID-19, n (%)		12 (6.7)
Quarantined, n (%)		
	Currently	17 (9.3)
	Past	62 (33.9)
	Never	104 (56.8)
Time spent in quarantine, mean (SD)		
	Current	15.18 (23.50)
	Past	20.07 (20.87)
Someone close to participant mandated quarantine, n (%)		68 (38.6)
Someone close to participant worked on front lines during pandemic, n (%)		55 (30.4)

Someone close to participant hospitalized from COVID-19-related infection, n (%)		14 (10.6)

Anxiety

The average score of the GAD-7 during COVID-19 was 8.19 (n=178, sd=5.46), and over 70% of participants (n=129) had at least mild anxiety. Figure 1 depicts the breakdown of GAD-7 categorical scores.

Figure 1: Generalized Anxiety Disorder 7-item (GAD-7) score categorical breakdown during the COVID-19 pandemic (N=178). Scores range from 0-21. 27.5% (n=49) had minimal anxiety (scores 0-4), 37.1% (n=66) had mild anxiety (scores 5-9), 20.2% (n=36) had moderate anxiety (scores 10-14), and 15.2% (n=27) had severe anxiety (scores 15-21).
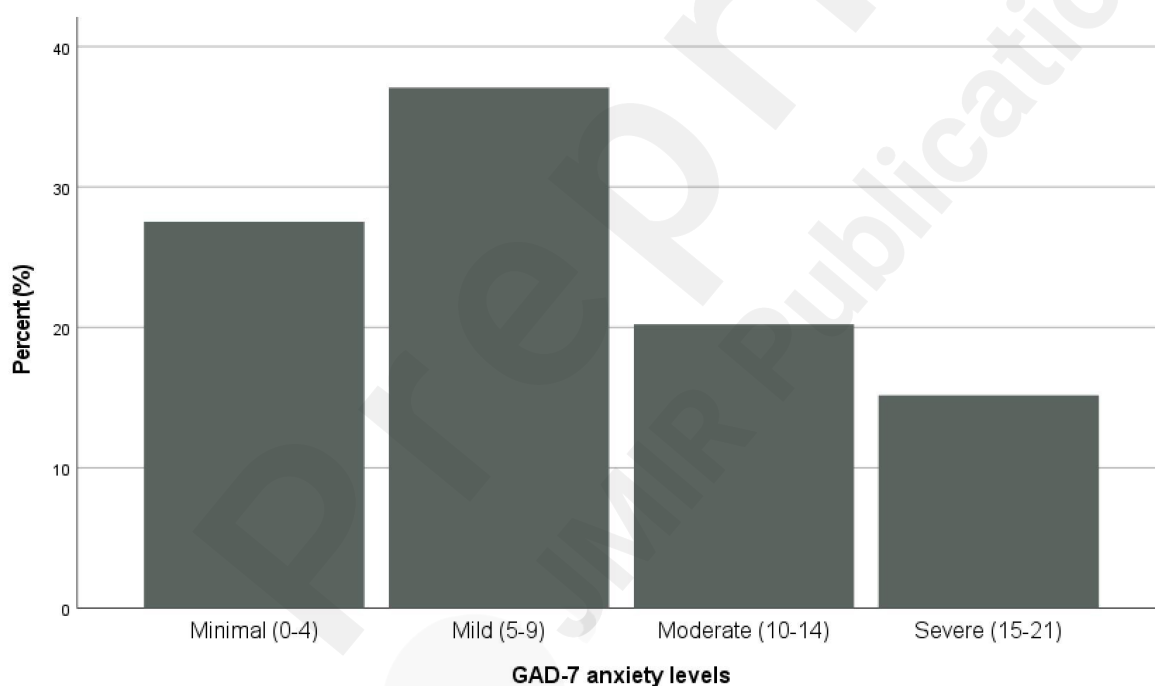
We found statistically significant differences between GAD-7 scores and gender (t(173)=-3.352, P<.001), where females had higher scores (x=9.08, SD 5.08, n=125) than males (n=6.10, SD 5.86, n=50). We also found that quarantine status had statistically significant differences in anxiety scores (F(2,175)=3.442, P=.034) with a significant difference between those who never quarantined (x=7.48, SD 5.35, n=101) and those who quarantined in the past (x=9.67, SD 5.43, n=60). There was

also a significant difference in anxiety scores (t(162.184)=2.705, *P*=.008) between those who had

someone close to them have a mandated quarantine (x=6.79, SD 4.62, n=67) and those who did not

have someone close to them mandated a quarantine (x=8.97, SD 5.87, n=104). There was also a

significant difference in anxiety scores (t(127)=2.855, *P*=.005) between those who had someone

close to them hospitalized due to a COVID-19 infection (x=4.43, SD 3.80, n=14) and those who did

not have someone close to them hospitalized (x=8.39, SD 5.01, n=115).

There were also associations found for level of anxiety for gender (*P*<.001), race (*P*=.010),

continent of location (*P*<.001), quarantine status (*P*=.037), and whether someone close to the

participant was mandated a quarantine (*P*=.036) (Table 3).

Table 3: Associations between demographics and level of anxiety (from the Generalized Anxiety
Disorder 7-item questionnaire) in young adults (ages 18-28) during the first wave of the COVID-19
pandemic (prior to January 2021) (N=183)

|	Minimal n (%)	Mild n (%)	Moderate n (%)	Severe n (%)	Test statistic	*P*-value
Gender						
Male	25(50.0)	14 (28.0)	5 (10.0)	6 (12.0)	X2(3,175)=18.611	*P*<.001
Female	23 (18.4)	51 (40.8)	30 (24.0)	21 (16.8)		
Race						
White	40 (28.8)	58 (41.7)	23 (16.5)	18 (12.9)	Fisher's exact=20.268	*P*=.010
Asian	6 (24.0)	4 (16.0)	9 (36.0)	6 (24.0)		
Black/African American	*	*	*	*		
American Indian	*	*	*	*		
Other	*	*	*	*		
Continent of location						
Europe	32 (26.4)	52 (43.0)	28 (23.1)	9 (7.4)	Fisher's exact=28.124	*P*<.001
North America	10 (25.0)	11 (27.5)	4 (10.0)	15 (37.5)		
Asia	4 (36.4)	2 (18.2)	2 (18.2)	3 (27.3)		
Africa	*	*	*	*		
Australia	*	*	*	*		
Quarantine status						
Never	34 (33.7)	33 (32.7)	21 (20.8)	13 (12.9)	Fisher's exact=12.933	*P*=.037
Currently quarantining	5 (29.4)	10 (58.8)	0 (0.0)	2 (11.8)		
Quarantined in the past	10 (16.7)	23 (38.3)	15 (25.0)	12 (20.0)		
Someone close to participant mandated quarantine						
No	26 (25.0)	34 (32.7)	22 (21.2)	22 (21.2)	X2(3,171)	*P*=.036
Yes	23 (34.3)	8 (41.9)	12 (17.9)	4 (6.0)		

*Denotes suppressed data since group has n<5

Depression

The average score on the PHQ-9 during COVID-19 was 10.14 (n=171, SD 6.12), and nearly

80% of participants (n=136) had at least mild depression. Figure 2 depicts the breakdown of PHQ-9

categorical scores.

Figure 2: Patient Health Questionnaire 9-item (PHQ-9) score categorical breakdown during the
COVID-19 pandemic (N=171). Scores range from 0-27. 20.5% (n=35) had no depression (scores 0-
4), 29.2% (n=50) had mild depression (scores 5-9), 23.4% (n=40) had moderate depression (scores
10-14), 19.3% (n=33) had moderately severe depression (scores 15-19), and 7.6% (n=13) had severe
depression (scores 20-27)
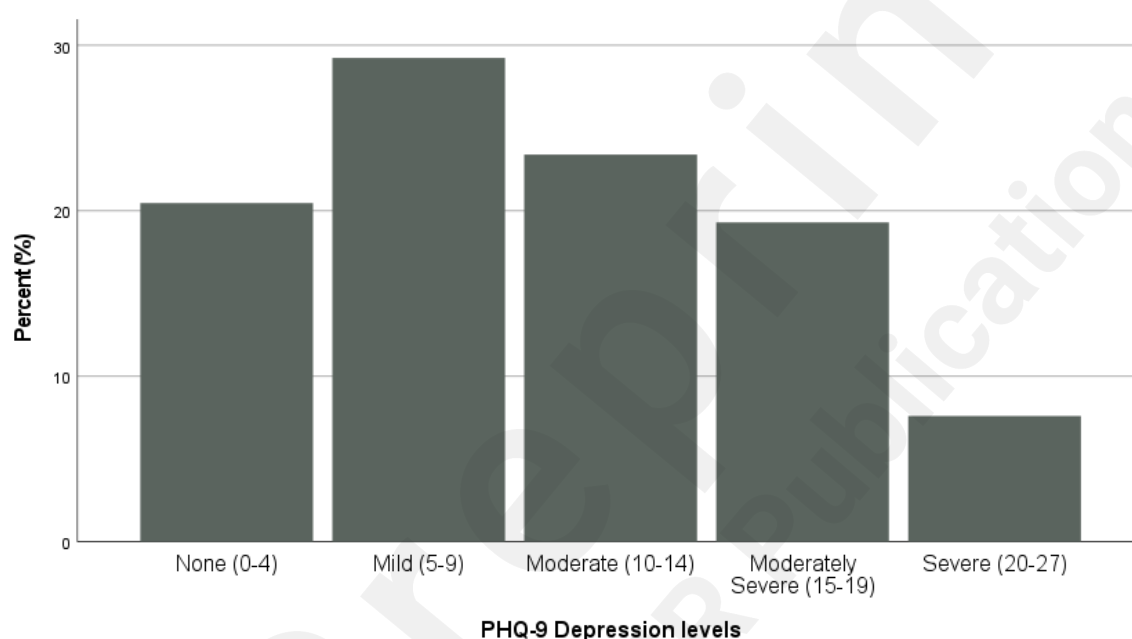
We found statistically significant differences between PHQ-9 scores and ethnicity

(F(2,156)=7.761, *P*<.001), where those who identified as Hispanic/Latino/a/x had higher depression

scores (x=16.45, SD 5.70, n=11) than those who did not identify as Hispanic/Latino/a/x or another

ethnicity (x=9.42, SD 5.65, n=119) and those who identified with another ethnicity (x=10.90, SD

6.28, n=29). There was also a statistically significant difference between PHQ-9 scores and gender

(t(166)=-3.310, *P*=.001), where females had higher scores (x=11.12, SD 5.74, n=121) than males

(x=7.74, SD 6.39, n=47). We also found that quarantine status had statistically significant differences

in depression scores (F(2,170)=3.092, *P*=.048) where those who were currently quarantining had an

average score of 8.23 (SD 6.51, n=17), those never quarantined had an average score of 9.54 (SD

5.76, n=94), and those who quarantined in the past had an average score of 11.62 (SD 6.35, n=60).

There was also a significant difference in depression scores (t(123)=3.111, *P*=.002) between those

who had someone close to them hospitalized due to a COVID-19 infection (x=5.36, SD 4.20, n=14)

and those who did not have someone close to them hospitalized (x=10.28, SD 5.72, n=111).

There were also associations found for level of depression for gender (*P*<.001), household

income (*P*=.006), and student status (*P*=.048), as shown in Table 4.

Table 4: Associations between demographics and level of depression (from the Patient Health Questionnaire 9-item questionnaire) in young adults (ages 18-28) during the first wave of the COVID-19 pandemic (prior to January 2021) (N=183)

	None n (%)	Mild n (%)	Moderate n (%)	Moderately severe n (%)	Severe n (%)	Test statistic	*P*-value
Gender							
Male	20 (42.6)	10 (21.3)	9 (19.1)	5 (10.6)	3 (6.4)	$X^2(4,168)=20.622$	*P*<.001
Female	14 (11.6)	39 (32.2)	31 (25.6)	27 (22.3)	10 (8.3)		
Household income							
Less than 50k	17 (18.7)	37 (40.7)	13 (14.3)	15 (16.5)	9 (9.9)	Fisher's exact=23.094	*P*=.006
50k-100k	7 (36.8)	1 (5.3)	8 (42.1)	2 (10.5)	1 (5.3)		
100k-150k	2 (25.0)	3 (37.5)	0 (0.0)	3 (37.5)	0 (0.0)		
150k +	2 (28.6)	1 (14.3)	3 (42.9)	0 (0.0)	1 (14.3)		
Student status							
No	9 (45.0)	4 (20.0)	4 (20.0)	1 (5.0)	2 (10.0)	Fisher's exact=8.945	*P*=.048
Yes	26 (17.2)	46 (30.5)	36 (23.8)	32 (21.2)	11 (7.3)		

Trauma from the pandemic

The average total score of the IES-R during the pandemic in young adults was 19.73 (n=156,

SD 14.44), with a mean score of intrusion of 0.81 (SD 0.70, n=169), a mean score of avoidance of

0.97 (SD 0.83, n=167), and a mean score of hyperarousal of 1.01 (SD 0.76, n=179). Almost 40% of

participants (n=61) at least had a low potential of meeting the criteria for post-traumatic stress

disorder (PTSD) from the COVID-19 pandemic. Figure 3 depicts the potential for PTSD based on

IES-R scores.

Figure 3: Potential for meeting criteria for post-traumatic stress disorder (PTSD) from the impact of

event-revised (IES-R) scores during the COVID-19 pandemic (N=183). 60.9% (n=95) had no

potential of having PTSD (scores 0-23), 25.5% (n=40) had low potential of having PTSD (scores 24-

32), 5.1% (n=8) had medium potential of having PTSD (scores 33-38), and 8.3% (n=13) had high potential of having PTSD (scores 39+)

Potential of post-traumatic stress disorder (PTSD) diagnosis (DSM-IV-TR criteria) from the IES-R scale
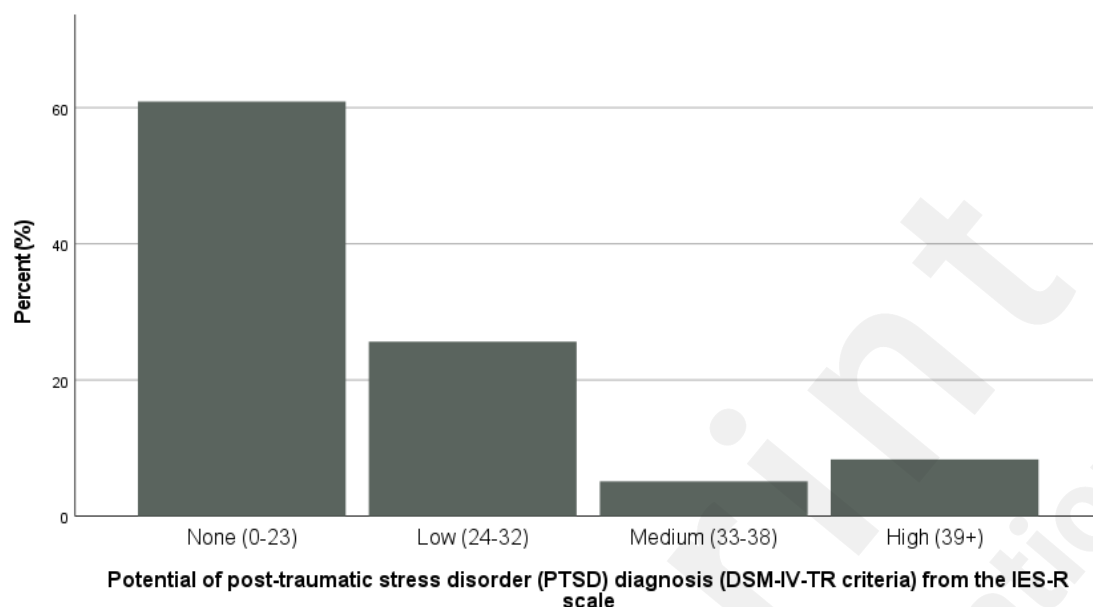
Age in 2020 was associated with IES-R total scores (n=156, r= -.164, P=.041). A linear regression found F(1, 154) = 4.230, P=0.041, R^2=0.027, adjusted R^2=0.20. The regression coefficient (B=-0.028, 95% CI [-0.055, -0.001]) indicated that an increase in age in 2020 by one year, on average, decreased IES total scores by 0.028 points.

We also found statistically significant differences between IES-R total scores and ethnicity (F(2,143)=3.999, P=.020), where those who identified as Hispanic/Latino/a/x had higher IES-R scores (x=32.56, SD 23.02, n=9) than those who did not identify as Hispanic/Latino/a/x or another ethnicity (x=19.24, SD 13.87, n=110) and those who identified with another ethnicity (x=18.15, SD 10.57, n=27). There was also a statistically significant difference between IES-R scores and gender (t(151)= -2.004, P=.047), where females had higher scores (x=21.24 SD 14.04, n=112) than males (x=15.98, SD 15.35, n=41). We also found that there was a significant difference between IES-R scores and employment status (F(3,151)=3.250; P=.024), where those who were employed full-time (x=11.24, SD 10.53, n=21) had significantly lower scores than those who were employed part-time

(x=21.85, SD 16.13, n=39) or those who were unemployed (x=21.14, SD 13.88, n=92). There was

also a significant difference in IES-R scores (t(149)=2.169; *P*=.032) between those who had

someone close to them mandated a quarantine (x=16.29, SD 11.83, n=59) compared to those who did

not have someone close to them mandated a quarantine (x=21.40, SD 15.43, n=92). Lastly, there was

a significant difference in IES-R scores (t(152)=-1.975, *P*=.050) between those who had someone

close to them hospitalized due to a COVID-19 infection (x=14.42, SD 12.10, n=12) and those who

did not have someone close to them hospitalized (x=20.10, SD 14.45, n=102).

There were also associations found for the potential of PTSD from the pandemic and

ethnicity (*P*=.031) and student status (*P*=.036) (Table 5).

Table 5: Associations between demographics and the potential of post-traumatic stress disorder
(PTSD) based off Impact of Event-Revised (IES-R) scores in young adults (ages 18-28) during the
first wave of the COVID-19 pandemic (prior to January 2021) in young adults during the COVID-19
pandemic (N=183)

	None n (%)	Low n (%)	Medium n (%)	High n (%)	Test statistic	*P*-value
Ethnicity						
Not Hispanic or Latino/a/x	70 (63.6)	25 (22.7)	5 (4.5)	10 (9.1)		
Hispanic or Latino/a/x	3 (33.3)	2 (22.2)	2 (22.2)	2 (22.2)	Fisher's exact=12.291	*P*=.031
Another ethnicity	15 (55.6)	11 (40.7)	1 (3.7)	0 (0.0)		
Student status						
No	13 (86.7)	0 (0.0)	1 (6.7)	1 (6.7)	Fisher's exact=7.498	*P*=.036
Yes	81 (57.9)	40 (28.6)	7 (5.0)	12 (8.6)		

Fear of COVID-19
The average score on the fear of COVID-19 was 16.27 (SD 5.70; n=182). 48.4% (n=88) of

participants had a high level of fear of COVID-19. We found that there was a significant difference

in fear of COVID-19 scores (t(173)=2.327; *P*=.021) between those who had someone close to them

mandated a quarantine (x=15.01, SD 5.87, n=68) compared to those who did not have someone close

to them mandated a quarantine (x=17.06, SD 5.52, n=107).

Discussion
In this study, we examined the prevalence of psychological issues (depression, anxiety, fear

of COVID-19) and its connections to risk factors associated with various demographics and social exposure to COVID-19 among young adults during the initial lockdown period of the pandemic. Our results showed that the majority of participants reported mild anxiety (> 70%), depression (80%), pandemic-related PTSD (~40%), and fear of COVID-19 (50%). Female respondents reported significantly higher levels of psychological issues, while Hispanic/Latino/a/x individuals exhibited depression and stress, and moderate-severe anxiety reported by Asians. Mandated quarantine was correlated with higher anxiety and depression levels compared to those not mandated, whereas quarantining with close contacts was associated with lower anxiety and IES-R scores. In addition, the hospitalization of close contacts due to COVID-19 was linked to lower anxiety, depression, and stress scores than those without hospitalized contacts.

Overall, young adults suffered with their mental health early during the COVID-19 pandemic, with an average GAD-7 score of 8.19 indicating mild anxiety within our sample. These findings are consistent with previously conducted research, suggesting significant increases in anxiety among young adults during the pandemic, likely influenced by various factors such as academic stress and medical history [23-25]. Similarly, we found evidence indicating that young adult females are more susceptible to higher anxiety levels during the pandemic[23,24]. Yet, Debowska *et al.* (2022) argue that this gender discrepancy may have existed before the pandemic, given the known higher prevalence rates of anxiety among females compared to males[25,26]. Additionally, individuals with a history of quarantine exhibited higher anxiety scores, highlighting the potentially detrimental effects of quarantine on mental health. This is a common finding associated with isolation and loneliness[27,28]. However, this was only found for those who quarantined in the past and not seen for those currently quarantining, potentially suggesting that the timeframe of quarantine may play a role in anxiety during the pandemic. Furthermore, Asian participants showed higher rates of moderate and severe anxiety compared to White participants, possibly influenced by increased racism toward Asians during the pandemic, as illustrated by Cheng

et al. (2021)[29]. Our study notably suggested that a young adult's inner circle may impact anxiety levels, with those having close contacts who experienced quarantine or hospitalization reporting lower anxiety levels. This finding is counterintuitive, as those who experienced heightened anxiety and stress during the pandemic often attributed their distress to concerns about individuals within their social circle being diagnosed with COVID-19[30,31]. This finding could be related to understanding the disease better because of first-hand experience or feeling less lonely because another is quarantining alongside them.

We found that participants exhibited an average PHQ-9 score of 10.14, indicative of moderate depression levels during the pandemic. This result aligns with existing research, suggesting a rise in depression within the general population that can be potentially influenced by factors such as school-related stress and loneliness [23,24,32]. Gender differences were also observed, with females experiencing a higher likelihood of severe depressive symptoms compared to males, a trend possibly existing before the pandemic given females' historically higher rates of depression[23,26]. Recent evidence shows that females not only suffer worse depression than males but also have worse long-term COVID-19 effects, which could both be mediators in cardiovascular disease (CVD) in women in the future[33]. We also found that participants currently in quarantine displayed lower depression scores compared to those who did not quarantine or had previously quarantined. This finding correlates with a recent study where participants reported higher levels of psychological distress and lower satisfaction in life due to intense quarantine restrictive levels, but not depression or anxiety[34]. This is a potential factor related to social connectedness and support, although not directly measured in our study, but recognized as a possible mediator of depression during social distancing. Hou *et al.* (2021) explore social support as a risk and protective factor regarding psychological distress among young adults during the pandemic, finding that social support might mediate mental health in this population[35]. Considering social circles are impactful in both anxiety and depressive symptoms in young adults during the pandemic, future interventions should integrate

social circle dynamics and leveraging models, like the biopsychosocial model, to enhance wellbeing[36].

A relatively novel and counterintuitive finding from our study suggests that participants who had someone close to them hospitalized due to a COVID-19 infection had lower depression scores than those who did not experience it. Research indicates that anxiety and depression can be lower in individuals during the pandemic, potentially related to social exposure[30]. Current literature focuses on depression after an individual has been hospitalized, and little exists on the psychological impact hospitalization has on a social circle. Thus, this finding lends a new perspective on the bidirectional relationship between social COVID-19 exposure and mental health. Future research should investigate why depression is lower in this population, as understanding it may lead to interventions to decrease depression in young adults for future pandemics.

Our investigation into depression highlighted additional disparities in mental health amid the COVID-19 pandemic, particularly concerning ethnicity and income. Individuals identifying as Hispanic or Latino/a/x exhibited higher depression scores. This disparity could be attributed to preexisting disparities compounded by factors such as increased financial strain, job insecurities, and limited access to healthcare[37]. Varying levels of depression severity were observed across different household income subgroups, with mixed differences noted. Those with household incomes below $50K and those within the $100-150k range showed higher proportions of mild depression. Those within the $100-150k range also displayed higher proportions of moderately severe depression. Current literature identifies the role of lower socioeconomic status (SES) as a determinant of mental health status during the COVID-19 pandemic, with evidence suggesting that individuals with higher education levels, potentially leading to increased income, experienced worsened well-being[37,38]. In addition, our findings revealed an association between student status and depression severity, with non-students displaying higher proportions of no depression compared to students. This association highlights the multifaceted nature of the relationship between SES and depression during COVID-

19, potentially influenced by various factors. Studies need to evaluate further how income plays a role in mental health during worldwide pandemics, as this can be a dynamic factor for future interventions to manage mental health in this population better.

Overall, our participants experienced pandemic-related stress, with nearly 40% potentially meeting the criteria for PTSD symptoms. This is an emerging, common trend among young adults during the pandemic[39,40]. Like other research, we found multiple demographic factors associated with varying stress levels. There was a decrease in trauma scores with increasing participant age, suggesting that older individuals in 2020 reported lower levels of trauma according to the IES-R scale. While age associations with pandemic-related trauma are not well-documented in young adults, existing research suggests a potential link between age and the impact of COVID-19, with older individuals being less likely to develop PTSD[41]. A cross-sectional survey in Mexico analyzing 3,932 individuals found that younger individuals experienced higher psychological distress from the pandemic[42]. Understanding resilience and protective factors between various ages can be helpful and should be a focus of research in the future, as this can lead to personalized approaches for mental health interventions for young adults. There were also significant differences among ethnicities, notably highlighting the impact on Hispanic and Latino/a/x populations. Despite limited research on this group, existing studies indicate that Hispanics and Latino/a/x individuals, along with low-income populations and women, have been significantly affected by pandemic-related stressors[43]. These stressors include financial hardship, healthcare and vaccine availability, discrimination and bias, and immigration burdens[43]. The heightened rates of COVID-19 exposure and rapidly shifting demographics in the southeastern US among Latino/a/x populations underscore the urgent need for mental health assessment and social support to address rising levels of post-traumatic stress and depression among young Latino/a/x adults[44]. Additionally, our findings revealed that young females exhibited higher IES-R scores compared to males, consistent with previous research indicating that women are more susceptible to severe depressive and post-

traumatic symptoms, especially among those diagnosed with COVID-19[45]. Current COVID-19 data further supports women's increased distress levels, potentially related to greater adherence to social distancing[45,46]. We also found employment status to be a significant factor, with unemployed or part-time employed individuals reporting higher IES-R scores than their full-time employed counterparts. This finding is consistent with existing literature highlighting socio-demographic characteristics, such as employment and financial status, as determinants of individual psychological response to the pandemic[47]. Our findings support the hypothesis that individuals with low SES are more likely to exhibit PTSD-like symptoms, emphasizing the adverse mental health effects of the economic downturn caused by the pandemic on vulnerable populations[47]. According to these findings, efforts to provide financial and mental health assistance for lower-income individuals and families are essential for mitigating the pandemic's impact on public health.

Regarding concerns related to the quarantine's impact on an individual's social network and distress from the pandemic, most participants exhibited lower IES-R scores if they had close contact subjected to quarantine or were hospitalized due to COVID-19. Participants also showed reduced fear of COVID-19 if a close contact of theirs was quarantined, suggesting a potential alleviation of pandemic-related stress through proximity. These findings contrast with previous research suggesting that prioritizing the well-being of family and friends over personal health increases the likelihood of PTSD symptoms[48]. While existing studies indicate that individuals in quarantine, young people, and those with close contacts infected with COVID-19 are more likely to experience fear related to the virus[49], further research is needed to understand the impact of a person's inner circle and mental health during the COVID-19 pandemic. Understanding protective factors and resilience utilizing biopsychosocial interventions would be beneficial, as it considers all aspects that the COVID-19 pandemic has affected—biology, psychology, and social settings.

Limitations
There are various limitations to consider in this study. The methodology of the online study design

could have introduced bias, as many of the measures are self-reported. A smaller sample size made it difficult to stratify by country, and respondents were stratified by continent. Because of this, it is challenging to analyze specific countries against each other and compare country-specific mandated public health interventions (i.e., mandated quarantines, social distancing). This study did not collect information on psychiatric disorders or data before the COVID-19 pandemic. In addition, the variables were limited for factoring in loneliness and social connection, complicating the analysis of the effect of both factors in data collection. Our sample population failed to resemble a comprehensive young adult population since most respondents were skewed to be female, white/Caucasian, and students from North America and Europe.

Conclusion

In conclusion, the findings from this study strengthen existing literature and add novel findings on the impact that the COVID-19 pandemic had on young adults' mental health. Our study demonstrated that depression, anxiety, distress from the pandemic, and fear from the pandemic were high in prevalence. Various SDOHs, like age, gender, ethnicity, and income, were influencing factors in mental health in young adults during COVID-19. Furthermore, social circles impacted an individual's mental health, especially if someone close to a participant was mandated a quarantine or if they were hospitalized due to a COVID-19 infection. Incorporating more biophysiological clinical care approaches, monitoring mental health outcomes, and identifying risk factors among young adults should be considered optimistic necessities for improving global mental health.

Availability of data and material

The raw data presented in this study are not publicly available. Participants received assurance that

all responses would remain confidential within the research team with limited access to databases except for the listed co-authors. The senior author OS can provide additional statistical analysis in response to a reasonable request.

Contributorship
All authors helped conceive the study, participated in methodology, and was involved in protocol development. MW and OS researched literature. DS gained ethical approval and was liaison with the institutional research committee board. MW and OS participated in patient recruitment and data cleaning. MW was involved with data analysis. OS and MW wrote the first draft of the manuscript. All authors reviewed and edited the manuscript and approved the final version of the manuscript.

Declarations:

Conflict of interests
None declared by the authors.

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Consent for publication
All authors give consent for publication

Abbreviations:

COVID-19: coronavirus-2019

PTSD-: post-traumatic stress disorder

PHQ-9: Patient Health Questionnaire 9-item

GAD-7: Generalized Anxiety Disorder 7-item

IES-R: Impact of Events Scale-Revised

FCV-19S: Fear of COVID-19 Scale

SES: socioeconomic status

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Supplementary Files

Figures

Generalized Anxiety Disorder 7-item (GAD-7) score categorical breakdown during the COVID-19 pandemic (N=178). Scores range from 0-21. 27.5% (n=49) had minimal anxiety (scores 0-4), 37.1% (n=66) had mild anxiety (scores 5-9), 20.2% (n=36) had moderate anxiety (scores 10-14), and 15.2% (n=27) had severe anxiety (scores 15-21).
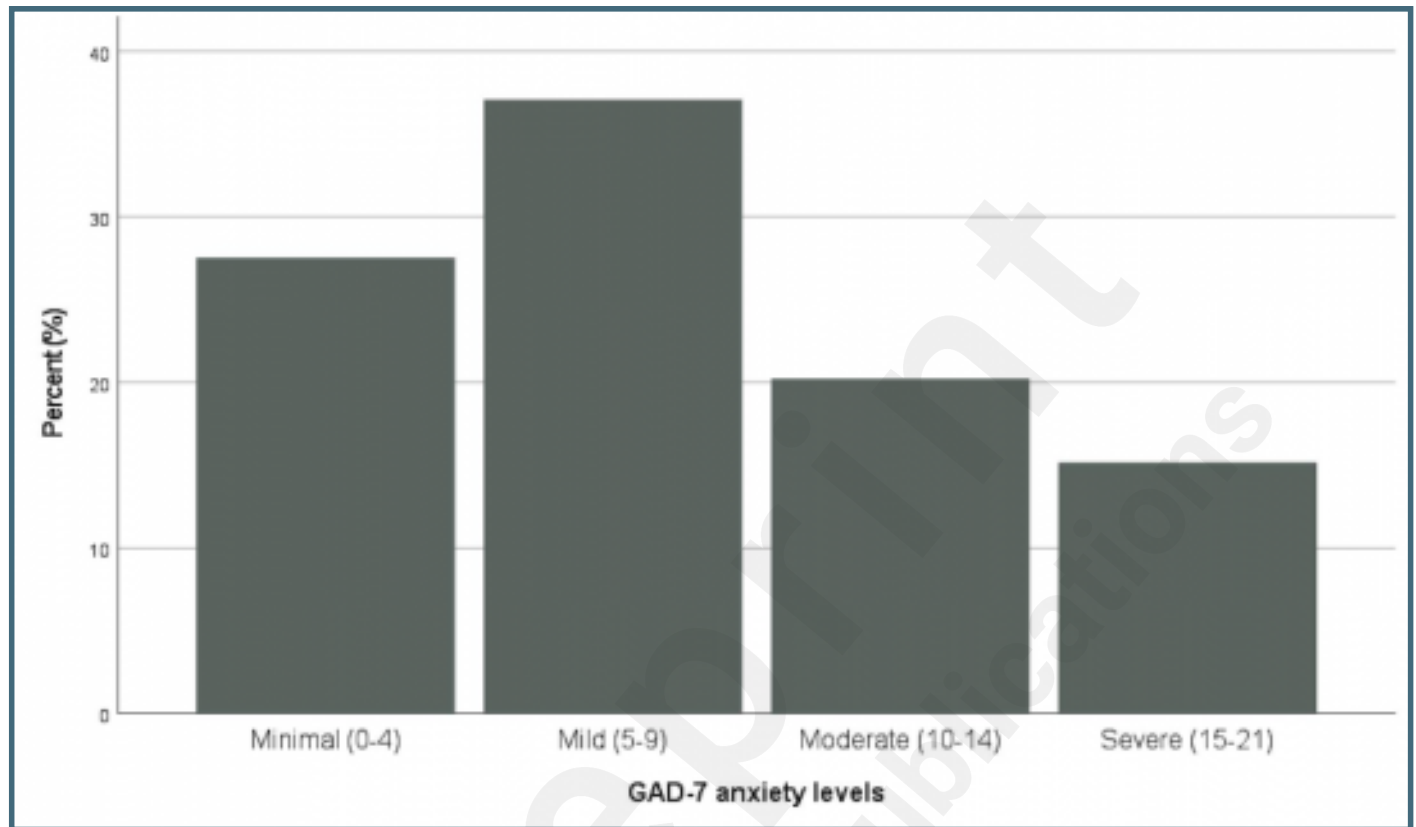
Patient Health Questionnaire 9-item (PHQ-9) score categorical breakdown during the COVID-19 pandemic (N=171). Scores range from 0-27. 20.5% (n=35) had no depression (scores 0-4), 29.2% (n=50) had mild depression (scores 5-9), 23.4% (n=40) had moderate depression (scores 10-14), 19.3% (n=33) had moderately severe depression (scores 15-19), and 7.6% (n=13) had severe depression (scores 20-27).
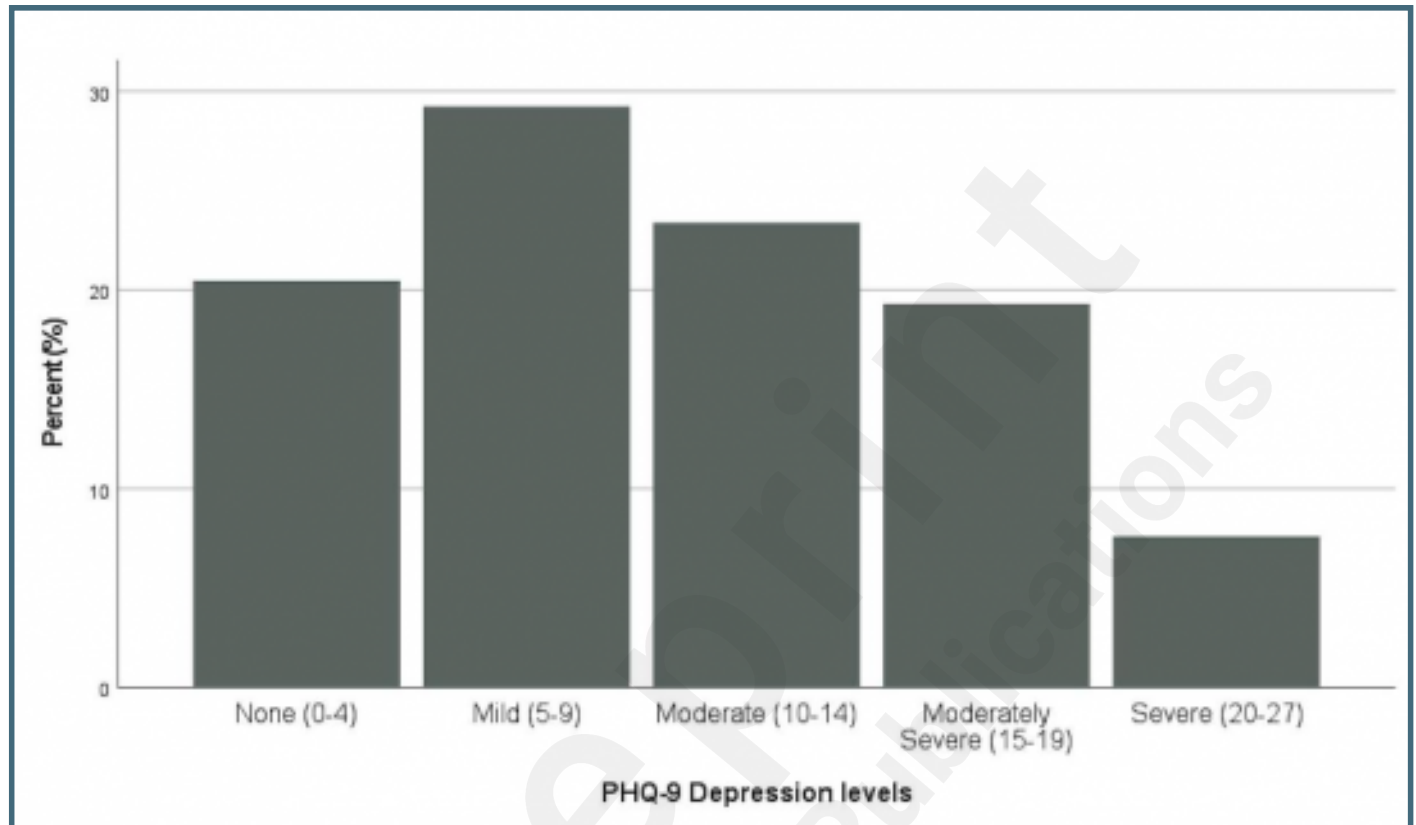
Potential for meeting criteria for post-traumatic stress disorder (PTSD) from the impact of event-revised (IES-R) scores during the COVID-19 pandemic (N=183). 60.9% (n=95) had no potential of having PTSD (scores 0-23), 25.5% (n=40) had low potential of having PTSD (scores 24-32), 5.1% (n=8) had medium potential of having PTSD (scores 33-38), and 8.3% (n=13) had high potential of having PTSD (scores 39+).
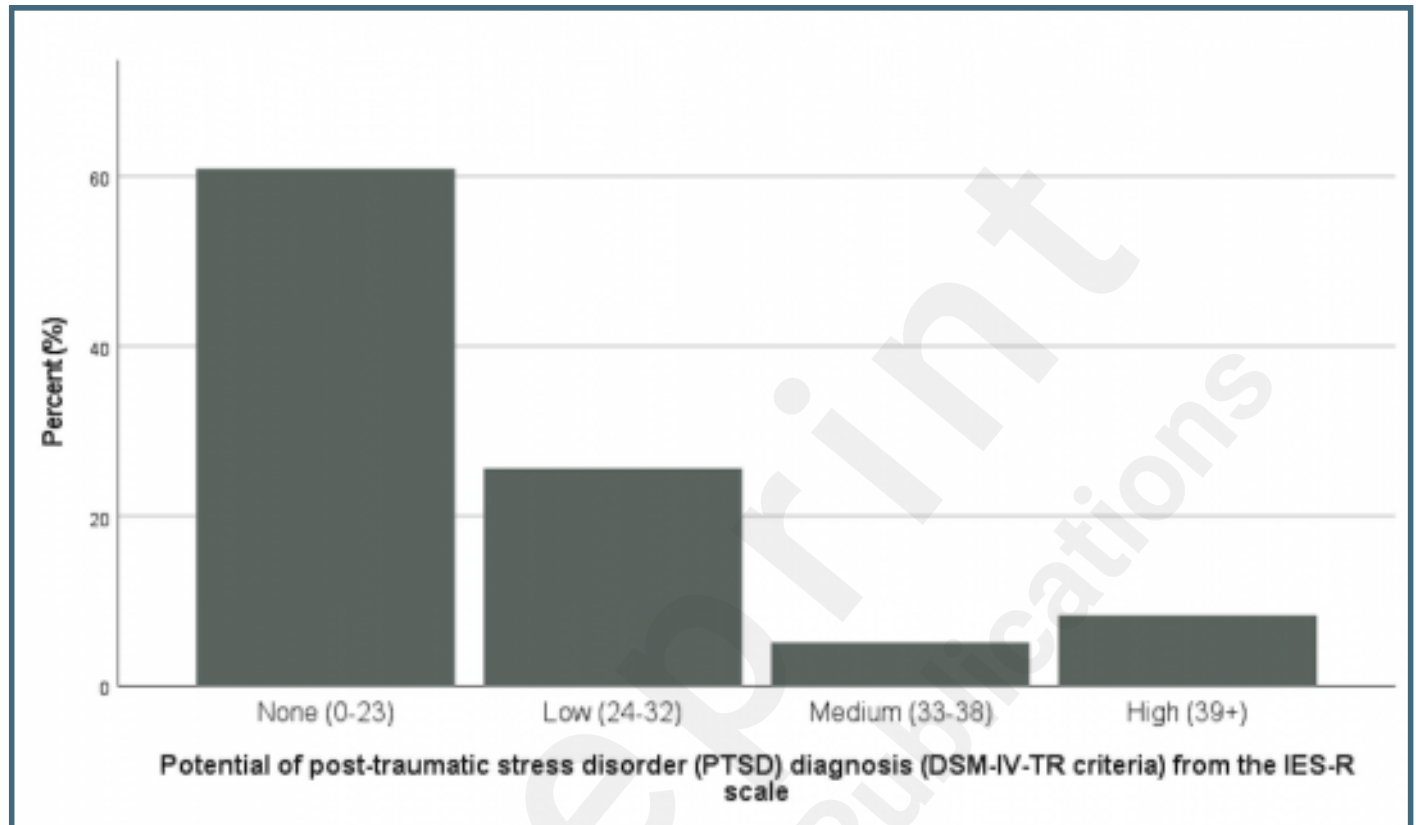
Multimedia Appendixes

Table 1: Summary of sociodemographic characteristics from eligible participants who completed the cross-sectional survey from September 2020 to January 2021 (N=183).
URL: http://asset.jmir.pub/assets/dabe7e91042eafbe09d11b038a07a1dd.doc

Table 2: Summary of COVID-19 variables from eligible participants who completed the cross-sectional survey from September 2020 to January 2021 (N=183).
URL: http://asset.jmir.pub/assets/ceb3a645c02d786c1f42464559efc31c.doc

Table 3: Associations between demographics and level of anxiety (from the Generalized Anxiety Disorder 7-item questionnaire) in young adults (ages 18-28) during the first wave of the COVID-19 pandemic (prior to January 2021) (N=183).
URL: http://asset.jmir.pub/assets/6b2ba0a2485551e3f14d5f3733bf7de3.doc

Table 4: Associations between demographics and level of depression (from the Patient Health Questionnaire 9-item questionnaire) in young adults (ages 18-28) during the first wave of the COVID-19 pandemic (prior to January 2021) (N=183).
URL: http://asset.jmir.pub/assets/97b346fb2e8b37116dfefef3fc78ae86.doc

Table 5: Associations between demographics and the potential of post-traumatic stress disorder (PTSD) based off Impact of Event-Revised (IES-R) scores in young adults (ages 18-28) during the first wave of the COVID-19 pandemic (prior to January 2021) in young adults during the COVID-19 pandemic (N=183).
URL: http://asset.jmir.pub/assets/5b537101803863601bf2b9513d5a695c.doc