Psychological Challenges of Adults With Severe Mental Illness During the COVID-19 Pandemic

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Abstract

Background: The COVID-19 pandemic was an unprecedented global health crisis. Vulnerable populations with preexisting mental illness have been disproportionately burdened and may experience adverse mental health outcomes related to the COVID-19 pandemic.

Objectives: Our objective was to evaluate the association between COVID-19 diagnosis, known exposure to COVID-19, sheltering in place, symptom severity, psychological distress, and depression severity among adults with severe mental illness (SMI).

Methods: In a cross-sectional study, participants were recruited among patients with SMI who visited an urban community health center in Georgia between February 1, 2019, and March 11, 2021. Measures included COVID-19 impacts on the symptoms of schizophrenia and other psychotic disorders, and severe mood disorders with psychotic features, depression symptoms, self-reported psychological distress, and social connectedness.

Results: Adults diagnosed with COVID-19 experienced more severe psychological distress (odds ratio [OR] = 2.48, 95% CI, 1.02–6.28) compared to those not diagnosed with COVID-19. After adjusting for sex and age, adults with SMI who sheltered in place during the lockdown experienced higher psychological distress than those who did not (adjusted odds ratio [aOR] = 2.52, 95% CI, 1.02–6.48). Women experienced significantly higher SMI severity (Brief Psychiatric Rating Scale scores [$\bar{x} \pm$ SD] for women = 56.7 ± 24.4 vs men = 48.5 ± 19.1; [P = .039]) and higher odds of depression (OR = 2.74, 95% CI, 1.22–6.13) during the pandemic than men. Furthermore, adults with SMI with high social support experienced higher psychological distress than those with low social support (aOR = 4.60, 95% CI, 1.82–11.8).

Conclusions: The findings of this study emphasized the need to incorporate infectious disease responses with mental health interventions during a public health crisis.

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Severe mental illness (SMI) is a mental, behavioral, or emotional disorder resulting in severe functional impairment, substantially interfering with or limiting one or more major life activities.[1] In 2019, the National Survey of Drug Use and Health (NSDUH) estimated that 13.1 million adults aged 18 years or older in the United States live with an SMI, including 2.5 million adults below the poverty line.[1] In Georgia, close to 3.6% of adults have severe mental health conditions such as schizophrenia, bipolar disorder, and major depressive disorders.[2] An individual with an SMI has a 1 in 5 chance of ending up in prison instead of a hospital due to their mental illness.[1] The vulnerability and sensitivity of people with SMI to infectious disease increases the susceptibility of challenging emotional responses to major events, such as the COVID-19 pandemic, including fear, anxiety, stress, depression, and the risk of worsening psychotic symptoms, such as paranoia, delusions, and hallucinations.[3–6]

To stop the spread of the SARS-CoV-2 virus during the COVID-19 pandemic, the United States and countries worldwide enforced social distancing measures and lockdown orders. The COVID-19 pandemic caused one of the largest global lockdowns, with more than a third of the world's population placed on a lockdown at some point.[3] During the lockdown, individuals were required to shelter inplace, quarantine, or isolate to slow the spread of COVID-19. While both quarantine and isolation were public health measures used to prevent exposure to people who have or may have a contagious

Clinical Points

- Vulnerable populations with preexisting mental illness have been disproportionately burdened and may experience adverse mental health outcomes related to the COVID-19 pandemic.
- Adults with severe mental illness diagnosed with COVID-19 and those who sheltered in place during the lockdown experienced more severe psychological distress compared to those not diagnosed with COVID-19.
- Mental health interventions need to be incorporated with infectious disease responses during a public health crisis, particularly for vulnerable populations.

disease, they are different. Quarantine separates and restricts people exposed to a contagious disease to reduce the risk of transmitting the disease to others. Isolation separates people who have been diagnosed with an infectious disease from people who are not. Although quarantine and isolation have been effective measures for reducing transmissions of infectious diseases during epidemics for centuries, they are often unpleasant for individuals who experience them. They require separation from loved ones and loss of freedom, leading to loneliness, boredom, and even adverse mental health issues.[4,5] Shelter in place is when all residents are asked to stay at home during an emergency. Studies have evaluated the mental health status of people with common and less severe mental health diagnoses, such as depression, anxiety, stress, and insomnia, during the COVID-19 pandemic (Supplementary Table 1).[7–24] Few studies focused on people with SMI who not only experienced financial difficulties and limited access to health during the pandemic but also have been "invisible" in the literature. This study focused on the mental health status of vulnerable people with SMIs during the pandemic. We hypothesized adults with SMI who were diagnosed with COVID-19, informed they were exposed to COVID-19, or sheltered in place during the pandemic would experience more severe symptoms of SMI, depression, and psychological distress compared to those who were not diagnosed, exposed, or sheltered in place.

METHODS

Using a cross-sectional design, data were collected at a community health center in the metropolitan area of Atlanta, Georgia, from April 27, 2021, to December 20, 2021. This research project was approved by Georgia Southern University's Institutional Review Board (Protocol # H21370).

Patients who visited the clinic during the study's data collection period were invited to participate in the study through nonprobability convenience sampling. Eligibility criteria required participants to be aged 18 years and older; living in the metro-Atlanta area; diagnosed with an SMI (defined as schizophrenia, bipolar disorder, or any mental illness that causes severe functional impairment, from the *International Classification of Disease, Tenth Revision [ICD-10]*: mental, behavioral, and neurodevelopmental disorders[25]); and receiving care between August 2020 to the time of data collection. Potential participants were excluded if they moved to the metro-Atlanta area less than 6 months before study enrollment, could not read and understand English, or had limited legal capacity to provide consent. The required sample size was based on previous studies[14,26] with an anticipated effect size between 0.2 and 0.3. With an α level (α) = 0.05, a total of 210 participants were required to have 85% power.[27] Recruitment took place during routine medical and behavioral appointments. Recruitment materials were posted throughout the facility, and an additional recruitment script was used by center staff to increase efforts and reach all potentially interested patients. Informed consent was obtained in person at the time of recruitment/enrollment.

Assessments included medical record abstraction of mental health diagnoses and sociodemographic characteristics. In-person assessments followed a COVID-19 safety protocol and evaluated COVID-19 experiences, severity of mental health symptoms, depression, and psychological distress. The exposures of interest for this study were self-reported COVID-19 diagnosis, COVID-19 exposure, and sheltering in place during the COVID-19 pandemic. Participants were asked if they had been diagnosed or exposed to COVID-19 since March 1, 2020. Participants were also asked if they sheltered in place during the lockdown mandate (effective April 3–13, 2020, in this area)[28] or at any time during the COVID-19 pandemic up to the point of data collection. Mental health status was assessed using the Brief Psychiatric Rating Scale (BPRS)[29–32] to assess the severity of mental health symptoms. BPRS total scores were categorized as mild (30 or less), moderate (31–51), and severe (52 and higher). SMI compliance, which refers to whether adults with SMI adhere to their treatment, was assessed by asking participants how often they took their psychiatric medication as prescribed, with response options including "always," "usually," "sometimes," and "rarely."

The Patient Health Questionnaire (PHQ-9)[33–35] was used to assess depression with categories of none (score, 0–4), mild (score, 5–9), moderate (score, 10–14), moderately severe (score, 15–19), and severe (score, ≥20).[33] Psychological distress was assessed using the Kessler Screening Scale for Psychological Distress (K-6),[36,37] which was dichotomized into low (score of 10 or less) and high (11 or higher) categories. Finally, the

Perception of Social Connectedness Scale (PSC)[38,39] was used and categorized as low (1.00–3.49) or high (≥3.50) based on PSC total score.[39] In addition to the PSC questions, change of social connectedness was assessed by asking "Has your social connectedness changed since your COVID-19 diagnosis/exposure/shelter-in-place?" for the exposure groups and "Has your social connectedness changed since March 1, 2020?" for participants who were neither diagnosed, had no known exposure, nor sheltered in place.

Other factors assessed in the study included self-reported COVID-19 vaccination status, housing stability, and the presence of risk factors for severe impacts from COVID-19, such as diabetes, hypertension, cardiovascular disease, chronic kidney disease, HIV, asthma, tuberculosis, and hepatitis B/C.

Statistical Analysis

Ordinal logistic regression was used to analyze the association between COVID-19 diagnosis, known exposure, or sheltering in place and SMI severity, with "less severe" as the reference. Individual analyses were conducted for each potential exposure (being diagnosed with COVID-19, known exposure to COVID-19, or sheltering in place). The association between COVID-19 diagnosis, known exposure, or sheltering in place and psychological distress was analyzed using logistic regression with the dichotomous K-6 scores as the outcome and the three independent predictors (COVID-19 diagnosis, exposure, and sheltering in place) as the exposures. The association between COVID-19 diagnosis, known exposure, or sheltering in place and depression severity was analyzed using ordinal logistic regression with the categorized PHQ-9 scores as the outcome and the 3 independent predictors (COVID-19 diagnosis, known exposure, and sheltering in place) as the exposures. Each possible exposure was evaluated in a separate model. Ordinal logistic regression was also used to analyze the association between social connectedness and mental health status with mental health status BPRS (3 categories), K-6 (dichotomous), and PHQ-9 (5 categories) as the outcomes, each in individual models.

The analysis reported descriptive statistics for age, sex, marital status, race, income, insurance status, and education level. All covariates were reported using frequency and percentages for categorical variables and mean with standard deviation for continuous variables. Covariates were assessed for potential inclusion in regression models based on scientific literature and each covariate's association with each type of exposure (COVID-19 diagnosis, known exposure, and shelter in place). Due to the small sample size, 2 models were examined in addition to the crude model. The partially adjusted model adjusted for only age and sex. To explore the potential confounding effects of additional variables, a fully adjusted model was also examined, recognizing it was not sufficiently powered. The bivariate analysis of the covariates and outcomes (SMI severity, depression severity, and psychological distress) was assessed, followed by a comparison of models adjusted for each covariate individually. If the change β coefficient for the main exposure changed by 10% or more comparing the crude vs adjusted model, the covariate was retained for the final model. All analyses were performed using SAS 9.4.[40]

RESULTS

Characteristics of the Study Population

Of the 108 adults who expressed interest in the study and were eligible, 101 (93.5%) completed assessments. Participant characteristics are summarized in Table 1. The mean age of the participants was 40.3 years (SD = 10.9). Twenty-seven percent reported a history of COVID-19 diagnosis, 43% reported known exposure to COVID-19, and 65% reported sheltering in place during the lockdown mandate in Georgia at the time of data collection. Most of the respondents were Black (67%), females (56%), non-Hispanic (94%), single (65%), unemployed (62%), and uninsured (39%).

The primary *ICD-10* mental health diagnoses for the sample were 35.64% major depressive disorders (*ICD-10* codes: F32 and F33), 35.64% bipolar disorders (F30 and F31), 9.9% schizophrenia (F20), 6.93% schizoaffective disorders (F25), and 5.94% schizotypal disorder (F21) (Table 1). Bipolar II disorder was the most common primary *ICD-10* diagnosis in all COVID-19 groups: diagnosed (25.9%), exposed (27.9%), and sheltered in place (27.3%). Most of the participants had co-occurring conditions with substance abuse (75.3%), had existing physical comorbidities known to increase the risk of complications from COVID-19 (75.2%), and were unvaccinated for COVID-19 (58.4%). About 54% of participants reported they adhered to their prescribed psychiatric medication during the pandemic. Those diagnosed with COVID-19 were also more likely to be smokers (59%) than those without a COVID-19 diagnosis (35%) ($P = .04$). An association was also observed between adhering to shelter-in-place orders and residence status. A greater proportion of participants (56.1%) who reported stable housing (owning or renting their home) sheltered in place during the lockdown compared to those who stayed in inpatient or treatment facilities (6.1%) or transitional living facilities (15.2%) ($P = .01$). Women had higher BPRS scores compared to men ($\bar{x} \pm SD = 56.7 \pm 19.1$ vs 48.5 ± 19.1, $P = .039$).

Bivariate analysis of demographic characteristics and COVID-19 experiences indicated people who were employed were more likely to know about their COVID-19 exposure ($P = .05$). Further, those participants with higher levels of education were associated with a lower likelihood of known COVID-19 exposure ($P = .04$).

Table 1.

Comparisons of Social and Clinical Characteristics Between Participants in COVID-19 Groups (Diagnosed, Known Exposure, and Shelter in Place)

		Diagnosed			Known exposure			Sheltered in place		
Participants' characteristics	Total, 101	Yes 27 (26.73%)	No 74 (73.27%)	*P* value	Yes 43 (42.57%)	No 58 (57.43%)	*P* value	Yes 66 (65.35%)	No 35 (34.65%)	*P* value
Demographics										
Age (mean [SD]) = (40 [12.6])										
18–24 y	4 (3.96)	1 (3.70)	1 (4.05)	.29	1 (2.33)	3 (5.17)	.62	3 (4.55)	1 (2.86)	.74
25–44 y	61 (60.40)	13 (48.15)	48 (64.86)		26 (60.47)	35 (60.34)		37 (56.06)	24 (68.57)	
45–64 y	3 (31.68)	11 (40.74)	21 (28.38)		13 (30.23)	19 (32.76)		23 (34.85)	9 (25.71)	
65 y and older	4 (3.96)	2 (7.41)	2 (2.70)		3 (6.98)	1 (1.72)		3 (4.55)	1 (2.86)	
Race										
Black/African American	68 (67.33)	20 (74.07)	48 (64.86)	.47	27 (62.79)	41 (70.69)	.52	46 (69.70)	22 (62.86)	.51
White/Caucasian or other	33 (34.67)	7 (25.93)	26 (35.14)		16 (37.21)	17 (29.31)		20 (30.30)	13 (37.14)	
Ethnicity										
Hispanic	6 (5.94)	1 (3.70)	5 (6.76)	.99	3 (6.98)	3 (5.17)	.30	3 (4.55)	3 (8.57)	.41
Non-Hispanic	95 (94.06)	26 (96.30)	69 (93.24)		40 (93.02)	55 (94.83)		63 (95.46)	32 (91.43)	
Sex										
Female	56 (55.45)	14 (51.85)	31 (41.89)	.87	25 (58.14)	31 (54.39)	.68	40 (60.61)	16 (47.06)	.20
Male	43 (42.57)	12 (44.44)	42 (56.76)		17 (39.53)	26 (45.61)		25 (37.88)	18 (52.94)	
Employment status										
Employed	38 (37.62)	11 (40.74)	27 (36.49)	.69	21 (48.84)	17 (29.3)	**.05**	25 (37.88)	13 (37.14)	.99
Unemployed	63 (62.38)	15 (55.56)	47 (63.51)		22 (51.16)	41 (70.71)		41 (62.12)	22 (62.86)	
Education										
Less than 12th grade	15 (14.85)	7 (25.93)	8 (10.81)	.37	10 (23.26)	5 (8.62)	**.04**	11 (16.6)	4 (11.43)	**.05**
High school diploma/GED	31 (30.69)	8 (29.63)	23 (31.08)		13 (30.23)	18 (31.03)		25 (37.88)	6 (17.14)	
Vocational/technical diploma	7 (6.93)	1 (3.70)	6 (8.11)		1 (2.33)	6 (10.34)		3 (4.55)	4 (11.43)	
Some college or university	36 (35.64)	10 (37.04)	26 (35.14)		17 (39.53)	19 (32.76)		22 (33.33)	14 (40.00)	
Bachelor's degree (BA and BS)	6 (5.94)	1 (0.99)	5 (6.76)		2 (4.65)	4 (6.90)		2 (3.02)	4 (11.43)	
Graduate	6 (5.94)	0 (0.00)	6 (8.11)		0	6 (10.34)		3 (4.55)	3 (8.57)	
Marital status										
Single	66 (65.35)	17 (92.96)	49 (66.22)	.31	25 (58.14)	41 (70.69)	.11	42 (63.64)	24 (68.57)	.49
Married	16 (15.84)	4 (14.81)	12 (16.22)		10 (23.26)	6 (10.34)		13 (19.70)	3 (8.57)	
Divorced/separated	9 (8.91)	1 (3.70)	8 (10.81)		2 (4.65)	7 (12.07)		5 (7.58)	4 (11.43)	
Living with a partner	10 (9.90)	5 (18.52)	5 (6.76)		6 (13.95)	4 (6.90)		6 (9.09)	4 (11.43)	
Insurance status										
Uninsured	40 (39.60)	12 (44.44)	28 (37.84)	.54	18 (41.86)	22 (37.93)	.88	26 (39.39)	14 (40.00)	.47
Medicare/Medicaid	31 (30.69)	6 (22.22)	21 (28.38)		13 (30.23)	17 (29.31)		22 (33.33)	8 (22.86)	
Private insurance	30 (29.70)	9 (33.33)	25 (33.78)		12 (27.91)	19 (32.76)		18 (27.27)	13 (37.14)	
Lifestyle										
COVID-19 vaccination status										
Yes	42 (41.58)	14 (51.85)	11 (40.74)	.87	14 (32.56)	28 (48.28)	.15	29 (43.94)	13 (37.14)	.53
No	59 (58.42)	12 (44.44)	16(59.26)		29 (67.44)	30 (51.72)		37 (56.06)	22 (62.86)	
Smoking status										
Nonsmoker	42 (41.58)	16 (59.26)	26 (35.14)	**.041**	17 (39.53)	25 (43.10)	.838	28 (42.42)	14 (40.00)	.535
Smoker	59 (58.42)	11 (40.74)	48 (64.86)		26 (60.47)	33 (56.90)		38 (57.58)	21 (60.00)	
Physical comorbidities										
Yes	76 (75.25)	19(70.37)	57 (77.03)	.820	32 (74.42)	44,975.86)	.921	50 (75.76)	26 (74.29)	.914
No	25 (24.75)	8 (29.63)	17 (22.97)		11 (25.58)	14 (24.14)		16 (24.24)	9 (25.71)	
Place of living										
Own or rent	48 (47.52)	11 (40.74)	37 (50.00)	.313	20 (46.51)	28 (48.28)	.919	37 (56.06)	11 (31.43)	**.010**
Someone else's house	21 (20.79)	8 (29.63)	13 (17.57)		9 (20.93)	12 (20.69)		11 (16.86)	10 (28.57)	
Homeless (shelter streets/outdoors/group)	12 (11.89)	3 (11.11)	9 (12.16)		6 (13.96)	6 (10.34)		4 (5.70)	8 (22.86)	
Transitional living facility	13 (12.87)	3 (11.11)	10 (13.51)		6 (13.95)	7 (12.7)		10 (15.15)	3 (8.57)	
Detox/inpatient or treatment facility	7 (6.93)	2 (7.41)	5 (6.76)		2 (4.65)	5 (8.62)		4 (6.06)	3 (857)	

(continued)

Table 1 (continued).

Participants' characteristics	Total, 101	Diagnosed			Known exposure			Sheltered in place		
		Yes 27 (26.73%)	No 74 (73.27%)	*P* value	Yes 43 (42.57%)	No 58 (57.43%)	*P* value	Yes 66 (65.35%)	No 35 (34.65%)	*P* value
Mental health characteristics										
Primary SMI *(ICD-10)* diagnosis										
Schizophrenia	10 (9.90)	5 (18.52)	5 (6.76)	.449	6 (13.95)	4 (6.90)	.769	7 (10.61)	3 (8.57)	.891
Schizotypal disorder	6 (5.94)	1 (3.70)	5 (6.76)		2 (4.65)	4 (6.90)		4 (6.06)	2 (5.71)	
Brief psychotic disorder	2 (1.98)	0	2 (2.70)		0	2 (3.45)		1 (1.52)	1 (2.86)	
Schizoaffective disorders	7 (6.93)	3 (11.11)	4 (5.41)		3 (6.98)	4 (6.90)		5 (7.58)	2 (5.71)	
Manic episodes (bipolar I)	9 (8.91)	2 (2.70)	7 (9.6)		4 (9.30)	5 (8.62)		6 (9.09)	3 (8.57)	
Bipolar disorder (bipolar II)	27 (26.73)	7 (25.93)	20 (27.03)		12 (27.91)	15 (25.86)		18 (27.27)	9 (25.71)	
Major depressive disorder, single episode	14 (13.86)	1 (3.70)	13 (17.57)		7 (16.28)	7 (12.07)		12 (18.18)	4 (11.43)	
Major depressive disorder, recurrent	22 (21.78)	7 (25.93)	15 (20.27)		7 (16.28)	15 (25.86)		12 (18.18)	10 (28.57)	
Other	4 (3.96)	1 (3.70)	3 (4.05)		2 (4.65)	2 (3.45)		3 (4.550)	1 (2.86)	
SMI treatment compliance										
Always (7 d/wk)	55 (54.46)	7 (25.93)	48 (64.86)	**.003**	24 (55.81))	31 (53.45)	.133	33 (50.00)	22 (62.86)	.115
Usually (3–6 times a week)	14 (13.86)	6 (22.22)	8 (10.81)		8 (8.60)	6 (10.34)		10 (15.15)	4 (11.43)	
Sometimes (twice a week)	21 (20.79)	10 (37.04)	11 (14.86)		10 (23.26)	11 (18.97)		18 (27.27)	3 (8.57)	
Rarely (once a week)	6 (5.94)	4 (14.81)	7 (8.46)		1 (2.33)	10 (17.01)		5 (7.58)	6 (14.14)	
Co-occurring (mental health and substance abuse)										
Yes	76 (75.25)	15 (55.56)	50 (67.57)	.348	27 (62.79)	38 (65.52)	.835	44 (66.67)	21 (60.00)	.525
No	25 (24.75)	12 (44.44)	24 (32.43)		16 (37.21)	20 (34.48)		22 (33.33)	14 (40.00)	
Social support										
Social support (mean [SD] = 3.6 [1.1])										
Low levels (score 1.00–3.49)	34 (33.72)	10 (30.04)	24 (32.43)	.123	13 (30.23)	21 (36.21)	.670	20 (30.30)	14 (40.00)	.371
High levels (≥3.50)	67 (66.32)	17 (62.73)	50 (67.57)		30 (69.77)	37 (63.79)		46 (69.70)	21 (60.00)	
Change of social support										
Yes	26 (25.71)	9 (33.33)	17 (22.97)	.903	15 (34.88)	11 (18.97)	.106	18 (27.27)	8 (22.86)	.814
No	75 (74.34)	18 (66.67)	57 (77.03)		28 (65.12)	47 (81.03)		48 (72.73)	27 (77.14)	

Variable names are in bold font as well as statistically significant *P* values.
Abbreviations: ICD-10 = International Statistical Classification of Diseases, Tenth Revision; GED = General Educational Development; SMI = serious mental illness.

Education was similarly associated with sheltering in place with people with higher education levels being more likely to shelter in place ($P = .05$) (Table 1). Other demographic characteristics including age, race, sex, marital status, and insurance status were not associated with COVID-19 experiences.

Association of social connectedness and mental health status. The association between social connectedness and mental health status indicated participants with high social support had 85% higher psychological distress (odds ratio [OR] = 4.15, 95% CI, 1.68–10.26) compared to people with low social support (Table 2). This association was maintained after adjusting for age, sex, and compliance (adjusted odds ratio [aOR] = 4.61, 95% CI, 1.81–11.02). Thus, adults with SMI who had high social support experienced severe psychological distress during the COVID-19 pandemic compared with those with low social support. The association between social support and SMI severity (BPRS; aOR = 1.10, 95% CI, 0.64–1.23) was not statistically significant. Moreover, there was no observed association between the change in social support, SMI severity, depression, and psychological distress.

Association of COVID-19 diagnosis/exposure/shelter in place and SMI severity. To have common covariates for all models and simplify the interpretation of results, common confounders were identified. Sex, age, and SMI compliance were impactful for at least 2 outcomes. Because both sex and age are demographics and known risk factors for both mental health status and COVID-19, they were adjusted in a partial model. In the second model, SMI compliance was adjusted for in addition to age and sex, because SMI compliance was a clinical risk factor for mental health status and COVID-19. Results were obtained using both strategies—once in a "partially adjusted" model controlling for age and sex and in a "fully adjusted" model also controlling for treatment compliance in addition to age and sex; both sets of results are shown in Table 2 along with crude associations. Given the sample size, the "fully adjusted" model is likely underpowered but may still provide insights.

Participants diagnosed with COVID-19 experienced more severe psychological distress (OR for high vs low K-6 = 2.48, 95% CI, 1.02–6.28) compared to those who were not diagnosed with COVID-19 (Table 2). In the crude analysis, COVID-19 diagnosis was not associated with SMI severity or depression severity. Known exposure to COVID-19 or following shelter-in-place orders was not associated with psychological outcomes

Table 2.

Association of COVID-19 and Social Connectedness With Mental Health Outcomes

Predictor variables	Crude			Partially adjusted[a]			Fully adjusted		
	BPRS, OR (CI)	PHQ-9, OR (CI)	K-6, OR (CI)	BPRS, OR (CI)	PHQ-9, OR (CI)	K-6, OR (CI)	BPRS, OR (CI)	PHQ-9, OR (CI)	K-6, OR (CI)
Diagnosis with COVID-19 (ref = no)									
Yes	1.37 (0.58–3.22)	1.64 (0.69–3.89)	**2.48 (1.02–6.28)**	1.63 (0.62–3.78)	1.95 (0.80–4.84)	**2.52 (1.02–6.48)**	1.85 (0.73–4.70)	1.39 (0.54–3.61)	2.51 (0.94–6.74)
Known exposure to COVID-19 (ref = no)									
Yes	1.24 (0.58–2.64)	1.51 (0.69–3.25)	1.53 (0.65–3.63)	1.31 (0.61–2.84)	1.66 (0.52–3.67)	1.59 (0.26–3.82)	1.34 (0.60–2.85)	1.95 (0.84–4.47)	1.64 (0.68–3.97)
Shelter in place (ref = no)									
Yes	1.35 (0.62–2.94)	1.86 (0.83–4.11)	1.39 (0.56–3.37)	1.37 (0.62–3.06)	1.80 (0.78–4.16)	**1.46 (1.32-7.01)**	1.30 (0.62–3.11)	1.70 (0.72–3.98)	1.51 (0.61-3.74)
Age, y	1.00 (0.97–1.00)	1.00 (0.96–1.00)	1.01 (0.98–1.00)	1.00[b] (0.97–1.04)	1.00[b] (0.96–1.00)	1.04[b] (0.94–1.01)	1.01 (0.97–1.04)	1.01 (0.97–1.03)	1.01 (0.94-1.01)
Sex (ref = male)									
Female	2.03 (0.94–4.31)	**2.74 (1.22–6.13)**	1.00 (0.42–2.90)	2.01[c] (0.97–4.53)	**2.81[c] (1.25–6.36)**	1.22[c] (0.48–3.08)	2.11 (0.97–4.51)	**3.01 (1.33–7.18)**	0.87 (0.36–2.11)
Insurance status (ref = uninsured)									
Private insurance	0.95 (0.39–2.37)	**3.15 (1.21-8.19)**	1.03 (0.36–2.93)	0.86 (0.34–2.40)	**2.72 (1.03-7.17)**	1.01 (0.35–2.84)	0.87 (0.34–2.21)	2.31 (0.85–6.27)	1.05 (0.36-3.02)
Education (ref = ≤high school/GED)									
Some college/vocational or technical	0.78 (0.35–1.72)	0.44 (0.19–1.01)	0.89 (0.35–2.21)	1.05 (0.46–2.45)	1.76 (0.76–4.22)	1.34 (0.42–3.08)	0.94 (0.39–2.21)	0.70 (0.26–1.47)	1.14 (0.43-3.03)
Bachelors' degree or higher	1.16 (0.34–3.98)	0.77 (0.23–2.67)	1.14 (0.29–4.42)	1.49 (0.41–5.47)	1.11 (0.23–2.81)	0.76 (0.17–3.41)	1.61 (0.42–6.19)	0.62 (0.21–2.55)	1.04 (0.25–4.37)
Smoking status (ref = nonsmoker)									
Smoker	1.11 (0.52–2.35)	1.62 (0.54–2.50)	0.90 (0.38–2.14)	1.19 (0.52–2.74)	0.63 (0.25–1.56)	1.04 (0.42–2.58)	1.16 (0.49–2.74)	1.43 (0.61–3.33)	1.02 (0.44–2.55)
SMI treatment compliance (ref = less compliant[d])									
Very compliant	1.27 (0.57–2.80)	**0.33 (0.14–0.76)**	0.72 (0.30–1.78)	1.52 (0.64–3.63)	**0.29 (0.12–0.70)**	1.36 (0.41–3.12)	—	—	—
Place of living (ref = unstable/ transitional/temporary)									
Stable (own/rent)	1.39 (0.66–2.93)	1.43 (0.67–3.01)	0.78 (0.33–1.87)	1.33 (0.59–2.94)	0.66 (0.27–1.67)	1.31 (0.50–3.40)	1.43 (0.50–3.38)	1.49 (0.66–3.36)	1.52 (0.62–3.72)
Social connectedness variables									
Social support (ref = low levels score 1.00–3.49)									
High levels (≥3.50)	1.10 (0.64–3.06)	0.55 (0.24–1.23)	**4.15 (1.68–10.26)**	1.56 (0.70–3.48)	0.51 (0.22–1.19)	**4.60 (1.82–11.8)**	1.55 (0.70–3.45)	0.52 (0.22–1.24)	4.61 (1.81–11.02)
Change of social support (ref = no)									
Yes	1.01 (0.45–2.42)	0.96 (0.41–2.30)	0.94 (0.35–2.46)	1.00 (0.38–2.14)	1.00 (0.39–2.26)	1.02 (0.37–2.64)	1.00 (0.40–2.33)	0.71 (0.27–1.47)	1.04 (0.38–2.82)

[a]Adjusted for age and sex.
[b]Only adjusted for sex.
[c]Only adjusted for age.
[d]Very compliant = always or usually adheres to treatment; less compliant = sometimes or rarely adheres to treatment.
Abbreviations: BPRS = Brief Psychiatric Rating Scale, K-6 = Kessler Screening Scale for Psychological Distress, PHQ = Patient Health Questionnaire, SMI = serious mental illness.

in crude analysis. When controlling for age and sex, the association between COVID-19 diagnosis and psychological distress was maintained (OR = 2.52, 95% CI, 1.02–6.48). After further adjusting for SMI treatment compliance, severe psychological distress was 51% higher in people diagnosed with COVID-19 compared to those who were not diagnosed with COVID-19 (OR = 2.51, 95% CI, 0.94–6.74), which bordered on statistical significance. The odds of depression were 71% lower for participants who were more compliant with their SMI treatment (OR = 0.29, 95% CI, 0.12–0.70) compared to those who were less compliant, adjusting for age and sex. Participants who sheltered in place were more likely to have higher levels of distress, controlling for age and sex (OR = 1.46, 95% CI, 1.32–7.01), though this association did not remain after further adjusting for treatment compliance (OR = 1.51, 95% CI, 0.61–3.74). SMI treatment compliance decreased the odds of depression (OR controlling for age and sex = 0.29, 95% CI, 0.12–0.70) among participants.

In bivariate analysis, an association was observed between COVID-19 diagnosis and SMI compliance (Table 2). Participants diagnosed with COVID-19 tended to be less compliant than those without a COVID-19 diagnosis ($P = .003$). An association was also observed between adhering to shelter-in-place orders and residence status. A greater proportion of participants (56.1%) reported stable housing (owning or renting their home) sheltered in place during the lockdown compared to those who stayed in inpatient or treatment facilities (6.1%) or transitional living facilities (15.2%) ($P = .01$). Women were more likely to have depression (OR = 2.81, 95% CI, 1.25–6.36) compared to men, controlling for age. This association remained after further adjusting for treatment compliance (OR = 3.01, 95% CI, 1.33–7.18).

Finally, the correlations of measures of depression (PHQ-9), psychological distress (K-6), and mental health symptom severity (BPRS) were assessed to better understand the connection between these concepts. A moderate positive correlation was observed between depression and mental health symptom severity (Pearson correlation coefficient $r = 0.37$). In contrast, psychological distress and depression exhibited a weak negative correlation ($r = -0.18$), and a moderate negative correlation was observed between psychological distress and mental health symptom severity ($r = -0.33$).

DISCUSSION

This study evaluated the psychological challenges of people with SMI during the COVID-19 pandemic. Adults with an SMI who were diagnosed with COVID-19 experienced more than 2.5 times the severe psychological distress compared to those who were not diagnosed with COVID-19; those who sheltered in place during the lockdown experienced more than 2.45 times the psychological distress compared to those who did not shelter in place; women experienced significantly almost 3 times the depression during the pandemic compared to men. Adults with SMI who had high social support experienced 4.61 times the psychological distress compared to those with low social support. COVID-19 experiences of diagnosis, exposure, and sheltering in place were not associated with SMI severity or depression severity. This study was one of the first to investigate the psychological challenges of adults with SMI during the COVID-19 pandemic. At the time of assessment, the pandemic had been active for 1 year. The prolonged nature of the pandemic and the evolving stressors over time make it crucial to examine long-term challenges in vulnerable populations. Our study adds to the understanding of the pandemic's impact by focusing on a later stage of the pandemic, capturing the ongoing mental health challenges as the world adapted to the "new normal." These findings were consistent with findings from previous studies that explored the psychological impact of the COVID-19 pandemic (Supplementary Table 1). Findings from a meta-analysis suggested patients diagnosed with coronaviruses experienced severe psychological symptoms, including depressed mood and psychological distress, compared to patients who were not diagnosed with any respiratory disorders.[18] Studies in other countries have similarly reported increased depression,[18,21] anxiety,[18,21,40] and distress[14,16,24,41] associated with the pandemic. Collectively, the findings highlighted the impact of the COVID-19 pandemic on the mental health of adults. Furthermore, these results suggested living through the COVID-19 pandemic, regardless of contracting the virus, impacted the mental health status of people with SMI.

Research indicated that the outpatient psychiatric population was more vulnerable to impacts associated with the COVID-19 pandemic due to underlying cognitive impairment, preexisting chronic conditions, decreased access to care, and increased financial burdens, all of which have been previously documented.[6,41–43] Individuals suffering from an SMI exhibited cognitive deficits that directly affect their attention, memory, and executive functioning.[44,45] Without proper medication and treatment, people with SMI do not have the mental and functional capacity to acquire knowledge, develop plans, and make practical decisions, and, as a result, their behaviors and unhealthy lifestyle factors increase their risk for chronic physical conditions, such as cancer, diabetes, and cardiovascular disease.[46–48] In addition, the COVID-19 pandemic may have contributed to worsening mental health by disrupting daily life routines, limiting access to care, restricting transportation, interrupting employment, increasing financial needs, and increasing food insecurity. Finally, comorbid physical illnesses might have worsened during the pandemic when access to care

was reduced. Although there was no association between physical comorbidities and COVID-19 outcomes, it is possible that changes in physical health could impact psychological outcomes, particularly for people with unstable physical comorbidities.

Contrary to other studies,[22,31,47] this study did not find women were more likely to experience psychological distress than men (OR = 1.00, 95% CI, 0.42–2.90), although women experienced higher odds of depression (OR = 2.74, 95% CI, 1.22–6.13), our study's relatively small sample size, or our distinct patient population. Most previous studies have been conducted in Asia and European countries in the general population and among psychiatric inpatients, while this study's sample population was those diagnosed with an SMI in an urban outpatient clinic setting in the United States. Moreover, there may be methodological differences, including differences in instruments, variable measurement, sampling methods, and the duration of the pandemic at the time assessments were conducted in each study (further described in Supplementary Table 1). In addition to these methodological differences, the settings of previous studies were earlier in the pandemic, in comparison with our data collection, which began over 1 year into the pandemic. This time difference might be relevant as early studies would assess acute distress, whereas later studies better capture chronic distress. Also, more psychological distress might have been present at the beginning of the pandemic before vaccines became available.

This study found adults with SMI who had high social support experienced higher psychological distress compared to those with low social support. However, past research demonstrated that low social support was associated with higher social distress, increased the risk of recurrences of episodes of mental disorders by triggering the onset of new mental disorders, and led to severe mental health consequences.[49–51] High social support refers to strong connections with family, friends, or other support networks. While social media can provide communication and connections, it may not offer the same level of support as face-to-face interactions. Due to the COVID-19 pandemic, people heavily rely on virtual connections, but it may not always equate to high-quality support. The level of support matters more than the specific medium. The contrasting results in the present study could be explained by the disruptions of typical social channels during the pandemic. The pandemic lockdown forced many individuals to rely only on social media to interact with their family and friends who did not live in the same house, uncertainty carried by the pandemic coupled with frequent social media exposure. Although social media use during a public health emergency or lockdown may positively impact mental health, frequent social media exposure could lead to increased mental health disturbances, such as anxiety, depression, or posttraumatic stress disorder.[52,53] Moreover, the disruption of routines and support systems, such as work, school, and social activities, was particularly challenging for individuals with SMI. Although they may have had social support, the ongoing fear and uncertainty about health, safety, employment, and financial stability could still trigger or worsen symptoms of anxiety and depression. Limited access to mental health services during the pandemic further complicated individuals' ability to receive necessary care. Additionally, heightened stress from various pandemic-related factors may have intensified symptoms or triggered relapses in those with SMI. In these challenging times, seeking professional help from mental health providers remains crucial for those in need of support.

Strengths of the study include methodology to reduce the potential for information and misclassification bias by utilizing standardized clinical assessments to assess mental health symptoms and severity, verifying SMI diagnoses, and stratifying COVID-19-related impacts (diagnosis, known exposure, and sheltering in place). Importantly, it highlighted the psychological challenges of a vulnerable population during the pandemic. Due to the study's cross-sectional nature, the temporality of COVID-19-related events (diagnosis, exposure, and shelter in place) and mental health status cannot be determined. Also, asymptomatic cases of COVID-19 would not know they had experienced the virus and would be misclassified. Moreover, in the study area, contact tracing and notification efforts were initially strong, but as the prevalence of COVID-19 spread rapidly throughout the community, most people were likely exposed to COVID-19 regardless of their knowledge of the exposure. Therefore, these results are challenging to interpret and likely have limited accuracy as they only represent people with knowledge of having been exposed to COVID-19. Finally, the study is underpowered based on initial power calculations and might have failed to detect weak associations.

Despite these limitations, this study effectively applied a robust methodology to address the psychological challenges of racial and ethnic minorities with SMI. Moreover, primary data collection techniques were employed in a setting that was not previously represented in the literature. Enrollment from a single center with predominantly black participants limits the generalizability of our findings. However, this aligned with the aim of examining this specific population that is often underrepresented in research, particularly in the context of mental health and COVID-19. The insights gained from this population are valuable for understanding the unique experiences and challenges faced by this group. Future studies could benefit from a multicenter approach and more diverse sampling strategies to enhance the generalizability of the results.

The COVID-19 pandemic presented challenges for everyone, especially people with SMI, who not only had

increased risks of negative COVID-19 outcomes but also faced other factors that limited their ability to receive proper care, such as lack of insight, low cognitive impairment, financial barriers, and lack of support. In addition, they often live in poorer neighborhoods with less access to care and treatment and receive lower-quality medical and mental care.[54,55] Although telehealth was effective in treating people with SMI, this population, especially those diagnosed with COVID-19 during the pandemic, may not have the resources to obtain phone or internet service nor have the necessary technical skills to access telehealth independently. Recognizing these existing inequalities may be the start for potential interventions. People with SMI need unique, individually tailored care strategies based on their vulnerabilities and circumstances. Moreover, the findings of this study strongly imply that during a crisis (pandemic and natural disasters), it is crucial to consider the mental well-being of vulnerable populations. Furthermore, it is important that additional support services are provided that consider the mental well-being of individuals with SMI.

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Supplementary Material

Article Title: Psychological Challenges of Adults with Severe Mental Illness during the COVID-19 Pandemic

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LIST OF SUPPLEMENTARY MATERIAL FOR THE ARTICLE

DISCLAIMER

Supplementary Table 1. Overview of Studies Evaluating Mental Health and the COVID-19 Pandemic (Diagnosis, Exposure, Quarantine/Restrictions)

Source	Design	Population/N	Research Objective(s)	COVID-19 Related Focus	Comparison Group	Outcome Measures	Study Findings
Rogers et al [11]	Systematic Meta-Analysis	Various: China, Hong Kong, South Korea, Canada, Saudi Arabia, France, Japan, Singapore, the UK, and the USA.	To examine the two previous coronavirus epidemics, SARS and MERS; to identify the possible psychiatric and neuropsychiatric implications for the current pandemic.	Suspected or diagnosed COVID-19 patients	N/A	COVID-19-related symptoms; number of signs or symptoms; symptom severity (i.e., anxiety, depression, or trauma); proportion of diagnoses (i.e., anxiety, depression, and PTSD)	Signs suggestive of delirium are common in the acute stage of SARS, MERS, and COVID-19; there is evidence of confusion (27·9%; 95% CI 20·5–36·0 of patients), depressed mood (32·6%; 24·7–40·9), anxiety (35·7%; 27·6–44·2) from MERS and SARS, and delirium in 65% of intensive care unit COVID-19 patients. The meta-analysis yielded a point prevalence of depression of 14.9% (95% CI: 12.1%-18.2%; 77 of 517 cases from five studies), anxiety prevalence of 14.8% (95% CI 11.1%-19.4%; 42 of 284 cases from three studies), and post-traumatic stress disorder prevalence of 32.2% (95% CI 23.7–42.0; 121 of 402 cases from four studies).
Brooks et al [8]	Rapid review	Various	To review the psychological impact of quarantine after infectious disease outbreaks	Quarantine	N/A	Psychological outcomes and symptoms	Having a history of psychiatric illness was associated with experiencing anxiety and anger 4-6 months after quarantine. During the SARS, MERS, and Ebola, outbreaks commonly reported issues included reported boredom, loneliness, anxiety, fear, sadness, depression, stigma, emotional problems, and post-traumatic stress-related symptoms, such as stress, depression, irritability, insomnia, fear, confusion, anger, frustration, boredom, and stigma.

Source	Design	Population/N	Research Objective(s)	COVID-19 Related Focus	Comparison Group	Outcome Measures	Study Findings
Taquet et al [19]	Retrospective Cohort	Anonymous health records from 54 healthcare organizations in the US N= 62,365	To estimate the incidence of neurological outcomes in patients diagnosed with COVID-19	Diagnosed COVID-19 Patients	People without a self-reported psychiatric diagnosis	The incidence of neurological outcomes in patients diagnosed with COVID-19	A significantly higher rate of psychiatric disorders was observed among COVID-19 survivors. Within 14-90 days of COVID-19 diagnosis, the HR of incident psychiatric diagnosis was 18.1% (95% CI 17.6-18.6). People with a history of psychiatric illness had an increased risk of COVID-19 after adjusting for other COVID-19 risk factors (RR 1.65, 95% CI1.59-1.71; p<0.0001).
Taquet et al [20]	Retrospective Cohort	Anonymous health records from 54 healthcare organizations in the US N= 236, 379	To estimate the incidence of psychiatric and neurological morbidity 6 months after COVID-19 infection	Diagnosed COVID-19 Patients	All patients hospitalized patients non-hospitalized patients with intensive therapy unit admission	Psychiatric sequalae of COVID-19; psychotic, substance abuse disorders and mood and anxiety disorders	An association between COVID-19 diagnosis and increased incidence of neurological outcomes in the following 6 months after COVID diagnosis was observed (HR 33.62% (95% CI: 33·17–34·07)), but the incidence was higher in patients who were admitted to the intensive therapy unit 46.42% (95% CI: 44.78–48.09)
Lee et al [40]	Retrospective Cohort	South Korea residents aged 10 years and older who were tested for COVID-19 N= 216 418	To investigate the associations between mental illness and the likelihood of a positive severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)	Severe clinical outcomes of COVID-19	Patients with no mental illness, patients with any mental illness, and patients with SMI	Clinical COVID-19 outcomes	Patients with a SMI had a slightly higher risk for severe clinical outcomes of COVID-19 than patients without a history of mental illness (OR=3.94,95% CI: 1.73-9.00). Diagnosis of a mental illness was not associated with increased likelihood of testing positive for SARS-CoV-2 (OR 1.00, 95% CI: 0·93–1·08).
Hao et al [12]	Case-Control	People with depressive or anxiety disorders living in the community; China N= 76 patients with major depression or anxiety disorders and N= 109 controls.	To assess the psychological impact of people with psychiatric illnesses during the peak of 2019 COVID-19 epidemic with strict lockdown measures.	Self-reported COVID-19 symptoms; quarantine; unknown COVID-19 status	Non-psychiatric controls	Impact of Event Scale Revised (IES-R); Depression, Anxiety, and Stress Scale (DASS-21); Post-Traumatic Stress Syndrome (PTSD)	Compared to controls, psychiatric patients scored significantly higher for depression, anxiety, and stress: mean DASS anxiety score = 6.6 vs 1.5, ($p < 0.001$); mean DASS depression score = 8.3 vs 2.2 ($p < 0.001$); and mean DASS stress score = 8.0 vs 2.7 ($p < 0.001$) during the strict lockdown.

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Iasevoli et al [13]	Case-control	Patients with schizophrenia, bipolar disorder or major depression to non-psychiatric controls in Italy N= 205	To analyze the severity of COVID-19-related perceived stress, anxiety, depressive, and psychotic symptoms	One-month mass quarantine	Non-psychiatric controls	GAD, PHQ9, and PSS	SMI patients had higher mean PSS (16.3 vs 14.1, $p = 0.009$), GAD-7 (6.9 vs 5.5, t $p = 0.01$), and PHQ-9 scores (9.3 vs 6.2, $p < 0.0001$) and SPEQ paranoia subscale scores (10.7 vs 3.8, $p < 0.0001$) compared to healthy controls.
Liu et al [15]	Case-Control	Hubei, China Inpatients with schizophrenia suspected of having COVID-19 (n=21) Inpatients with schizophrenia without symptoms of COVID-19 (n= 30)	To examine the clinical characteristics, laboratory findings and chest CT results of hospitalized patients with schizophrenia with suspected COVID-19 in Hubei	Suspected COVID-19 Diagnosis	Patients who were not suspected of COVID-19	PANSS, PSS, HAMD, HAMA, PSQI	Compared with patients in the non-COVID-19 group (n=21), patients in the COVID-19 suspected group (had higher perceived stress score (PSS) (26.5 vs 11.6, $p < 0.001$), anxiety score (HAM-A) (13.9 vs 2.2, , $p < 0.001$), depression score (HAM-D) (14.1 vs 0.4, , $p < 0.001$) and sleep quality score (PSQI) (8.0 vs 4.7, $p = 0.005$)
Wang et al [22]	Case-control	United States Nation-wide database of electronic health records of adult patients N= 61 million	To assess the impact of a recent (within past year) diagnosis of a mental disorder, bipolar disorder, depression and schizophrenia – on the risk for COVID-19 infection and related mortality and hospitalization rates	The risk for COVID-19 infection and related mortality and hospitalization rates	Patients with COVID-19 infection but no mental disorder patients with a mental disorder but no COVID-19	The risk for COVID-19 infection and related mortality and hospitalization rates	Patients with a recent diagnosis of a mental disorder had significantly higher odds of COVID-19 infection than patients without a mental disorder, after adjusting for age, sex and ethnicity, with the strongest effect for depression (OR=10.43, 95% CI: 10.10-10.76, $p<0.001$) and schizophrenia (OR=9.89, 95% CI: 8.68-11.26, $p<0.001$).
Yang et al [23]	Case-control	Hospitalized COVID-19 patients in Zhejiang, China N= 143 including 26 patients diagnosed with COVID-19 in the isolation ward	To investigate and analyze the psychological status of patients with COVID-19 illness. To explore the effective mode of clinical psychological intervention in isolated acute patients.	COVID-19 isolation	87 patients with general pneumonia in the observation ward (General Pneumonia group) and 30 healthy volunteers (Normal group).	HAM-A and HAM-D	Higher depression (5.96.52±3.34) and anxiety (7.85±2.56) scores were observed in patients with COVID-19 compared with patients without COVID-19 ($p<0.0001$).

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Bo et al [7]	Cross-sectional	Quarantine facilities for COVID-19 patients in Wuhan, China N= 730	To examine the pattern of posttraumatic stress symptoms in clinically stable COVID-19 patients.	Diagnosed COVID-19 Patients	N/A	PTSS PTSD Checklist	Most clinically stable COVID-19 patients suffered from significant posttraumatic stress symptoms associated with the COVID-19 prior to discharge. Significant post traumatic stress was evident in 96.2% of patients (95% CI 94.8–97.6%).
Czeisler et al[9]	Cross-sectional	Adults 18 and older in USA N= 9,896	To estimate the prevalence of mental health outcomes during the COVID-19 pandemic (during June 24–30, 2020)	Symptoms of anxiety disorder and depressive disorder were assessed using the four-item PHQ-9^{I*} (4), and symptoms of a COVID-19–related TSRD were assessed using the 6-item IE scale	Stratified by age, race, and ethnicity	Symptoms of adverse mental or behavioral health conditions	Out of 5,470 respondents, 40.9% of U.S adults reported facing mental health conditions. These included symptoms of anxiety disorder or depressive disorder (30.9%), symptoms of trauma and stressor-related disorder (TSRD) related to COVID-19 (26.3%), increased substance use to cope with pandemic-related stress or emotions (13.3%), and seriously considering suicide within the past 30 days (10.7%).
Fisher et al [10]	Cross-sectional	Adults 18 and older in Australia N= 23, 749	To quantify the mental health burden of the most severe COVID-19 related restrictions based on time, location, COVID-19 experience, and sociodemographic	Covid-19-related restrictions	N/A	Effects of COVID-19 restrictions on mental health outcomes PHQ-9 & GAD	The prevalence rates of clinically significant depressive (Odds Ratio (OR) 1.96; 95% CI 1.62; 2.37) and anxiety (OR 1.87; 95% CI 1.53; 2.29) symptoms were substantially and significantly higher in Victoria than in other states and territories.
Gonzalez-Blanco et al [11]	Cross-sectional	Spain N= 21, 279	To explore the early psychological impact of the COVID-19 pandemic and the lockdown restrictions in a sample of 21,279 people living in Spain	COVID-19 Lockdown	Healthy controls; people with common mental disorders	COVID-19 Lockdown, DASS-21, IES	People with SMI had statistically significantly higher scores on anxiety, stress, and depression subscales of the DASS-21 compared with the healthy control group, but lower scores compared with the common mental disorders group (all $p < .05$). During the lockdown, people with SMI had higher subscale scores for anxiety (Mean ± SD = 1.77 ± 1.86), distress (2.40 ± 2.00), and depression (3.96 ± 1.19) compared to healthy controls (p-value = 0.026). However, after adjusting for confounders, anxiety

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							was the only significantly associated psychological variable with lower scores in healthy controls than people with SMI (OR = 0.721; 95% CI: 0.579–0.898).
Rohde et al [18]	Cross-sectional	EHR from five psychiatric hospitals providing inpatient and outpatient treatment in Denmark. N=918 patients. 21% with schizophrenia, 14% with major depression, 7% with bipolar disorder	To assess the impact of COVID-19 on patients across five psychiatric hospitals providing inpatient and outpatient treatment	Pandemic-related psychiatric symptoms	N/A	Pandemic-related psychiatric symptoms	918 patients comprised a Total of 1357 clinical notes. 621 females and 297 males described psychiatric symptoms related to the pandemic. There is an association between the number of COVID-19 cases in Denmark (and the societal restrictions) and the degree of pandemic-related psychopathology (predominantly anxiety, followed by Schizophrenia and related disorders and unspecific stress). Cases of covid-related mental disorders increased after the first case of COVID was identified in Denmark and increased sharply after the implementation of the nationwide lockdown.
Qiu et al [16]	Cross-sectional	36 provinces in China N=52,730	To assess the psychological distress in the general population of China during the COVID-19 epidemic	COVID-19 lockdown	N/A	COVID-19 Peritraumatic Distress Index (CPDI) to measure psychological distress, including the frequency of anxiety, depression, specific phobias, cognitive change, ranging from 0 to 100. A score between 28 and 51 indicates mild	Almost 35% of the respondents experienced psychological distress (29.29% of the respondents' scores were between 28 and 51, and 5.14% of the respondents' scores were ≥52). Female respondents showed significantly higher psychological distress than their male counterparts (mean (SD)=24.87 (15.03) vs 21.41 (15.97), p<0.001). People under 18 years had the lowest CPDI scores (mean (SD)=14.83 (13.41)). Individuals between 18 and 30 years of age or above 60 presented the highest CPDI scores (mean (SD)=27.76 (15.69) and 27.49 (24.22), respectively).

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						to moderate distress with a score ≥52 indicative of severe distress.	
Vissink et al [21]	Cross-sectional	Neitherlands Hostpitalized patients N= 189	To investigate the effects of COVID-19 and restrictive measures among patients with pre-existing psychiatric disorders	COVID-19 outbreak and restrictive measures	Patients with affective disorders	COVID-19 outbreak and restrictive measures, DASS-21, GHQ, BDI, PSWQ	Depressive and anxiety symptoms were more pronounced in affective disorder patients compared to psychotic disorder patients ($p<0.009$). The COVID-19 outbreak and restrictive measures, such as quarantine and lockdown, impacted people with a pre-existing affective diagnosis more than those with a psychotic diagnosis ($p = 0.046$).

Abbreviations: SMI= Severe Mental Illness, PANSS= Positive and Negative Syndrome Scale, PSS= Perceived Stress Scale, HAMD= Hamilton Depression Rating Scale, HAMA= Hamilton Anxiety Rating Scale, PSQI= Pittsburgh Sleep Quality Index, PTSD= Posttraumatic Stress Disorder, PTSs= Posttraumatic Stress Disorder, DASS-21= Depression, Anxiety, and Stress Scale, IES= Impact of Event Scale, GAD= Generalized Anxiety Disorder, PHQ-9= Patient Health Questionnaire, GHQ= General Health Questionnaire, BDI= Beck Anxiety Inventory, PSWQ= Penn State Worry Questionnaire