

# The Impact of Long-COVID on Mental Health

## A Systematic Review

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**Long-COVID, a chronic disease, poses threats not just to the patient's physical health but also their mental well-being. This study seeks to examine the impact of long-COVID on mental health in COVID-19 survivors through a literature review of 38 studies from 19 countries. The analysis results reveal that depression and anxiety disorders are the most pronounced mental health issues in this population, and that personal factors like gender, age, and economic status and environmental factors can all influence long-COVID's effects on their mental well-being. The study highlights the concerning prevalence and severity of mental health issues associated with long-COVID and the importance of increasing psychological support services for individuals with the post-COVID-19 syndrome and bolstering public knowledge about the condition.**

**Keywords:** Long-COVID; Post-COVID-19 Syndrome; Mental Health; Literature Review

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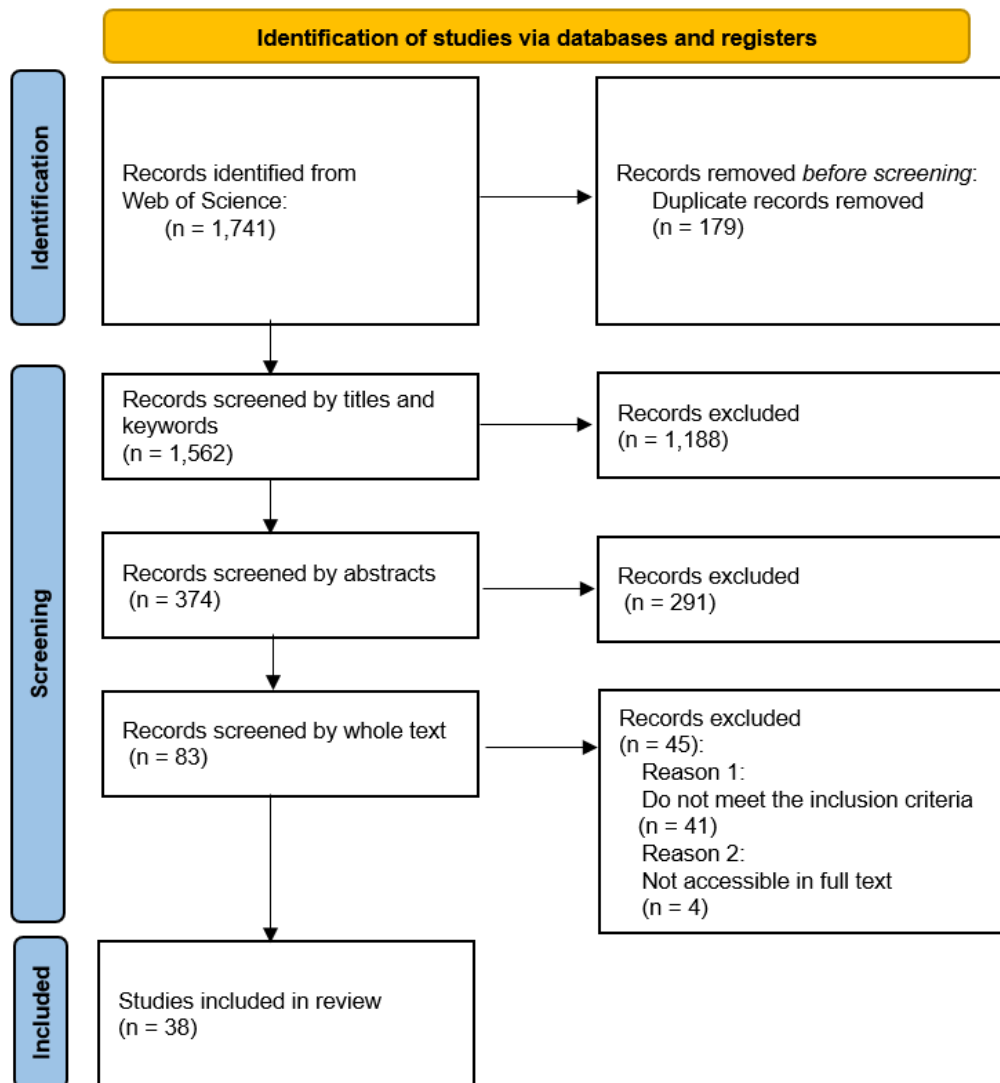


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### Introduction

**I**N THE PAST several years, COVID-19 has infected hundreds of millions of people and caused approximately 6.9 million confirmed deaths, bringing about severe social and economic disruption around the world. The development and deployment of the COVID-19 vaccine have reduced the counts of severe cases and deaths, and there have been ongoing governmental efforts to bring the lives of the public back on track. In May 2023, the World Health Organization (WHO) declared an end to the COVID-19 pandemic as a public health emergency of international concern. Nevertheless, the long-term physical and mental effects of COVID-19 remain a concerning issue.

Long-COVID or post-COVID-19 Syndrome (PCS) refers to the long-term pathological state that the COVID-19 patient experiences after seemingly recovering from the acute infection. There are several other terms for this condition in the field of medicine, such as post-acute COVID-19, ongoing symptomatic COVID-19, chronic COVID-19, and long-COVID (Garg et al., 2021). According to WHO's definition, long-COVID is a condition that "occurs in individuals with a history of probable or confirmed SARS-CoV-2 infection, usually three months from the onset of COVID-19, with symptoms that last for at least two months and cannot be explained by an alternative diagnosis" (WHO, 2021, P.1). As per the U.S. Centers for Disease Control



**Figure 1. Literature Search and Screening Processes.**

and Prevention (2021), long-COVID is “an infection-associated chronic condition that can occur after SARS-CoV-2 infection, the virus that causes COVID-19, and is present for at least 3 months as a continuous, relapsing and remitting, or progressive disease state that affects one or more organ systems.” Despite the lack of a conclusive definition for long-COVID, fatigue and shortness of breath, which may last for months, are deemed its most common symptoms. Other frequently reported persistent symptoms include chest and joint pains, palpitations, myalgia, smell and taste dysfunctions, cough, headache, and gastrointestinal and cardiac issues (Yong, 2021).

It is estimated that 10-15% of individuals infected with SARS-CoV-2 may develop long-COVID (Nalbandian et al., 2023). Kim et al. (2024) argued that long-COVID symptoms could last as long as 24 months with the potential of significantly compromising the patient’s quality of life. Chasco et al.’s

(2022) research findings show that long-COVID symptoms, particularly brain fog and fatigue, may pose negative impacts on multiple facets of the patient’s life, including everyday functioning, driving, employment, and interpersonal relationships. The impact of long-COVID on the patient’s mental health has also garnered serious attention in academia. Simonetti et al.’s study (2022) even suggests that long-COVID may result in increased suicide risks in the patients by causing physical distress and elevating mental pathological levels. Studies like these have substantially heightened the popular concerns over the adverse effects of long-COVID on the patient’s mental state. Our survey focuses on examining the possible impacts of long-COVID on mental health in COVID-19 survivors by reviewing relevant literature. Research questions include:

*Q 1: What are the specific effects of long-COVID on the mental*

**Table 1. Details of the Studies Included in the Literature Review.**

Authors	Study design	Countries	Samples (participants)		Assessment tools	Findings
			Number (Male/Female/Other)	Ages		
Abulsaad et al. 2023	Cross-sectional	Egypt	150 (64/86)	51.01±12.6 years	Depression: Patient Health Questionnaire (PHQ-9); Anxiety: Generalized Anxiety Disorder (GAD-7)	The prevalence of depression and anxiety were 65.3% and in the patients.
Bodini et al. 2024	Cross-sectional	Italy	332 (71/198) (63 missing)	≥ 18 years of age (most ≥ 36 years)	Depression: Patient Health Questionnaire (PHQ-9); Anxiety: Generalized Anxiety Disorder (GAD-7); Stress: Perceived Stress Scale (PSS-10)	70% (175/250) of respondents reported moderate to severe depressive symptoms, 53.8% (134/249) moderate to severe anxiety symptoms, and 91.8% (236/257) moderate to high levels of perceived stress.
Bota et al. 2024	Follow-up	Romania	86 (N/A)	55.2 ± 8.6 years	Depression: Hospital Anxiety and Depression Scale (HADS); Quality of life: WHOQOL-BREF; Coping Strategies (emotion): COPE-60	HADS scores revealed elevated depression (6.8 ± 1.9) and anxiety (7.1 ± 2.3) in the symptomatic group. Sadness, hopelessness, or depressive feelings were more predominant among the symptomatic individuals; WHOQOL-BREF showed lower scores in the symptomatic cohort across physical (58.8 ± 15.8), mental (56.3 ± 16.4), and social domains (50.2 ± 17.5); COPE-60 findings indicated a higher prevalence of disengagement (56.4%) and emotion-focused coping strategies (61.8%) in the symptomatic group.
Cai et al. 2023	Follow-up	China	450 (255/195)	42.32 ± 12.67 years	Depression: EuroQol five-dimension five level (EQ-5D-5L); Anxiety: Generalized Anxiety Disorder (GAD-7); PTSD: the PTSD Checklist Civilian Version (PCL-C)	Anxiety/depression and PTSD were more prevalent in long COVID patients than in healthy individuals; Long COVID people were significantly more likely to report anxiety (40.67%), depression (46.00%) and PTSD (19.33%).
Demko et al. 2024	Cohort	USA	70 (26/44)	median: 55 years (IQR:43–63)	Depression: Patient Health Questionnaire Depression 8-Item (PHQ-8); Anxiety: Generalized Anxiety Disorder (GAD-7); Cognition: General Practitioner Assessment of Cognition (GPCOG); Quality of life: Short-Form Health Survey (SF-36) & EQ-5D-5L	Brain fog or problems with concentration, memory problems, and confusion, 5% of participants endorsed any of the 3 cognitive symptoms at month 1–3, increasing to 30% at month 6, 24% at month 12, 19% at month 18, and 29% at month 24. Baseline anxiety and depression were not associated with ever having long COVID throughout the study. But participants with diagnosed pre-COVID-19 anxiety or depression were more likely to report decreased QoL.
Espinar-Herranz et al. 2023	Cross-sectional	Spain	57 (17/40)	48.06 years (SD:8.22)	Depression: Beck Depression Inventory (BDI-2); Anxiety: State-Trait Anxiety Inventory (STAI); Quality of life: Short Form-12 Health Survey (SF-12); Cognition: Memory Failures of Everyday (MFE); Fatigue & Sleep quality: Modified Fatigue Impact Scale (MFIS); Oviedo Sleep Questionnaire	Individuals with PASC experienced significant differences in various psychological aspects compared to control subjects. The impact on factors such as fatigue, sleep quality, memory issues, and perceived health is evident and demonstrates the psychological implications of the condition
Galanis et al. 2023	Cross-sectional	Greece	122 (33/89)	44.8 years (SD=11.5)	Depression/Anxiety: Patient Health Questionnaire-4; Quality of life: EuroQol five-dimension five level (EQ-5D-5L)	Anxiety and depressive symptoms were worse after the post-COVID-19 syndrome: mean anxiety score before the post-COVID-19 syndrome was 1.41 and after the syndrome was 3.22. Mean depression score before the post-COVID-19 syndrome was 0.81 and after the syndrome was 3.56. A statistically significant reduction in quality of life was observed among patients after the post-COVID-19 syndrome.
Giurgi-Oncu et al. 2021	Cross-sectional	Romania	143 (65/78)	44.06 ± 9.12 years	Depression/Anxiety: Hospital Anxiety and Depression Scale (HADS)	46.87% of inpatients and 27.84% of outpatients had clinical depression; anxiety was detected in

						34.37% of inpatients and 40.5% of outpatients
Hameed et al. 2024	Cross-sectional	Pakistan	100 (34/66)	≥ 18 years of age	Cognition: Mini-Mental State Examination (MMSE); Depression/Anxiety: Self-report questionnaires	COVID symptoms showed a significant negative correlation with MMSE scores ( $r = -0.04$ ), as the severity of COVID symptoms increases, cognitive function decreases slightly; Significant correlations were found between COVID-19 symptoms and emotional variables such as depression ( $r = 0.14$ , $p < 0.05$ ) and anxiety ( $r = 0.25$ , $p < 0.05$ ), indicating that the psychological burden of long-term COVID-19 is substantial.
Houben-Wilke et al. 2022	Follow-up	Netherlands	239 (41/198)	median: 50 years (IQR 39-56)	PTSD: Trauma Screening Questionnaire (TSQ); Depression/Anxiety: Hospital Anxiety and Depression Scale (HADS)	Patients with confirmed COVID-19 reported symptoms of PTSD, anxiety, or depression 3 and 6 months after the onset of COVID-19-related symptoms: At 3 months after the onset of symptoms, 37.2% of the patients were at risk for PTSD, which decreased to 26.8% at the 6-month follow-up; Symptoms of anxiety and depression were detected in 35.6% and 46.9% of all patients at the 3-month follow-up; the prevalence of symptoms of anxiety and depression remained high at the 6-month follow-up (34.7% for symptoms of anxiety, 40.6% for symptoms of depression)
Hurtado et al. 2024	Cohort	Colombia	100 (37/63)	43.5 years	Patients' demographics and medical history	Brain fog (60%), myalgia (42%), and numbness or tingling (41%) were the most common neurological symptoms, while fatigue (74%), sleep problems (46%), and anxiety (44%) were the most common symptoms.
Jangnin et al. 2024	Prospective	Thailand	390 (173/217)	31.8 ± 13.6 years	Depression: patient health questionnaire (PHQ-9); Anxiety: general anxiety disorder-7 (GAD-7); Sleep: Pittsburgh Sleep Quality Index; Epworth Sleepiness Scale; Functional Outcomes of Sleep Questionnaire (FOSQ-10)	91.8% of patients had no or minimal depression, 8.2% of patients experienced mild depression (4.4%), moderate depression (3.3%), or moderately severe depression (0.5%); Only 4.1% of patients experiencing mild to moderate anxiety; 38.1% of patients reported poor sleep quality.
Kaplan et al. 2023	Cross-sectional	Turkey	361 (181/180)	≥ 18 years of age	Depression: Beck's Depression Inventory; Cognition: Cognitive Appraisal Scale	Compared to those without COVID-19, the mean depression score, cognitive appraisal score of the young adults with COVID-19 were significantly higher. Long COVID syndrome causes impaired cognitive status, increased prevalence of depression, and musculoskeletal pain in young adults.
Kim et al. 2024	Prospective	South Korean	696 (146/550)	median: 32 years (IQR 20-59)	Depression: Patient Health Questionnaire-9 (PHQ-9); Sleep disturbance: Pittsburgh Sleep Quality Index (PSQI)	170 participants (24.4%) suffered from depression at 3 months, with the number falling to 156 (22.4%) at 6 months, the change was not statistically significant. 163 participants (23.4%) at 3 months reported suffering from sleep problems. At 6 months, this had decreased but not significantly (149 participants, 21.4%).
Kirchberger et al. 2024	Follow-up	Germany	210 (81/129)	median: 52 years	Depression: Patient Health Questionnaire (PHQ-D); Patient Health Questionnaire-9 (PHQ-9); Quality of life: Veterans RAND 12-Item Health Survey (VR-12)	Participants with PCS had significantly more posttraumatic stress, depressiveness, and fatigue, as well as worse mental QoL at both measure points.
Li et al. 2024	Cross-sectional	China	482 (195/287)	34.39 years	Depression/Anxiety/Stress: Depression, Anxiety, and Stress Scale (DASS); Connor-Davidson Resilience Scale (CD-RISC); Duke-UNC Functional Social Support Questionnaire (DUFSS)	LC symptomatology was significantly and positively associated with depression ( $t=2.09$ , $p=0.037$ ) and anxiety ( $t=4.51$ , $p<0.001$ ), but not stress. 61 (12.7%) exhibited symptoms of severe to extremely severe depression symptoms (mean=15.9, s.d=4.7), 26.8%

						(n=129) anxiety (mean=12.2, s.d.=4.8), and 25.1% (n=121) stress (mean=17.2, s.d.=3.8).
Lüscher et al. 2023	Cross-sectional	Austria, Germany and the German-speaking part of Switzerland	256 (25/231)	45.05 years (SD=12.16)	Depression/Anxiety: Hospital Anxiety and Depression Scale (HADS); Stress: Perceived Stress Scale (PSS)	For individuals with Long-COVID, receiving emotional support was related to higher well-being (positive affect: b=0.29, p<0.01; negative affect: b=-0.31, p<0.05) and less distress (anxiety: b=-1.45, p<0.01; depressive symptoms: b=-1.04, p<0.05; perceived stress: b=-0.21, p<0.05) but no effects emerged for receiving practical support.
McAlearney et al. 2024	Qualitative	USA	21 (5/16)	47.6 years (range: 19-68)	A semi-structured interview which was designed to explore the perspectives of Long COVID patients and included questions about symptom burden, impacts of Long COVID on physical and mental health, and support or lack of support from friends and family	Long COVID patients reported experiencing loss across multiple domains including loss of physical health, mental health, social support and connections, roles in their families, and self-identities, and described experiences of grief that mirrored the 5 stages of grief in the Kubler-Ross model: denial, anger, bargaining, depression, and for some, acceptance.
Moisoglou et al. 2024	Cross-sectional	Greece	122 (33/89)	44.8 years (SD=11.5)	Depression/Anxiety: Patient Health Questionnaire-4 (PHQ-4); Quality of Life: EuroQol-5D-3L	32.8% of patients with post-COVID-19 syndrome experienced severe psychological distress, 32.8% experienced moderate distress, 23% experienced mild distress, and 11.5% had no distress. 60.7% of patients had anxiety scores of ≥3 and 69.7% had depression scores of ≥3, indicating possible major anxiety or depression disorder.
Morrow et al. 2024	Case Series	USA	9 (3/6)	12.44 years (IQR: 4-18)	Depression/Anxiety: Beck Depression Inventory; Children's Depression Inventory (Second Edition); Multidimensional Anxiety Scale for Children (Second Edition); Revised Children's Manifest Anxiety Scale (Second Edition)	Most of these patients had preexisting attention and/or mood concerns. There were also some who self-reported elevated depression and anxiety symptoms.
Naik et al. 2024	Cross-sectional	USA	844 (274/570)	median: 46 years (IQR, 32-61)	Depression: Patient Health Questionnaire-8; Anxiety: General Anxiety Disorder-7	Participants with current PCC were approximately twice as likely to report depression and anxiety symptoms than other US adults (wPr, 37.2% vs 23.3%; AOR, 2.05; 95% CI, 1.40-2.98).
Nowakowski et al. 2022	Retrospective	USA	79 (24/55)	48.2 ± 12.4 years	Depression: Patient Health Questionnaire-9 (PHQ-9); Anxiety: Generalized Anxiety Disorder-7 (GAD-7); Stress: Impact of Events-6 (IES-6); Sleep quality: Pittsburgh Sleep Quality Index (PSQI)	The mean GAD-7 score was 8.3 (22.8%, n = 14 with severe depression). The mean PHQ-9 was 10.1 (17.8%, n = 18 with severe anxiety). The mean IES-6 was 2.1 (54.4%, n = 43 with post-traumatic stress). The mean PSQI score was 9.7 (82.3%, n = 65 with poor sleep quality).
Oh et al. 2024	Retrospective	South Korean	85 (31/54)	56.4 ± 15.2 years	Depression/Anxiety: Hospital Anxiety and Depression Scale (HADS)	Anxiety, depression and fatigue were reported by 36.5%, 34.1%, and 42.4% of the participants.
Omar et al. 2022	Cross-sectional comparative	Egypt	32 (4/28)	32.88 ± 6.955 years	Depression: Patient Health Questionnaire-9 (PHQ-9); Anxiety: General Anxiety Disorder-7 (GAD-7)	There was a highly significant direct correlation between post-infection with COVID19 and scores of both anxiety and depression (Beta = -0.745, P < 0.001). Both anxiety and depression scores increased significantly among the post-COVID-19 patients.
Pistarini et al. 2021	Cross-sectional	Italy	20 (13/7)	65.40years (SD: 11.51)	Cognitive impairment: Mini-Mental State Evaluation (MMSE); Montreal Cognitive Assessment (MoCA); Depression: Hamilton Rating Scale for Depression; Psychological distress: Impact of Event Scale-Revised (IES-R)	70.0% of the post-COVID patients showed cognitive deficits; Regarding emotional disturbances, ~40% of patients presented with mild to moderate depression (57.9–60%). Regarding psychological distress, 55% of post-COVID-19 patients presented with mild to severe symptoms.
Román-Montes et al. 2023	Cross-sectional	Mexico	187 (101/86)	median: 55 years (IQR, 41-63)	a PCS questionnaire	All five QoL dimensions were affected in PCS patients, showing increased pain/discomfort (67 vs. 39%, p = <0.001), difficulties

						in performing usual activities (39.2 vs. 20.3%, $p = 0.03$ ), and anxiety/depression (57.5 vs. 37%, $p = 0.02$ ).
Rudenstine et al. 2022	Cross-sectional	USA	1488 (457/1011/33)	26.7 years (SD: 9.72)	Depression: Patient Health Questionnaire (PHQ-9); Anxiety: Generalized Anxiety Disorder (GAD-7)	62% of the sample endorsed a high number of stressors, and 38.0% endorsed a low number of stressors. Roughly 48% of the sample met the cutoff for probable depression, 37.1% met the cutoff for probable anxiety, and 32.6% met the cutoff for probable comorbid depression and anxiety. Women participants, 3.2 [1.5-6.9], as compared to men, lower-SES participants, 2.16 [1.1-4.2], as compared to higher-SES participants, participants with higher COVID-19 related stress levels, 4.8 [2.0-12.0], as compared to those with low levels, and participants with long-COVID, 3.7 [1.9-7.0], as compared to those without, all had higher odds of probable comorbid depression and anxiety.
Sabry et al. 2023	Cross-sectional comparative	Egypt	280 (N/A)	55% of patients aged between 18 and 35 years	Psychometric tests: General Health Questionnaire (GHQ); Structured Clinical Interview for DSM-IV (SCID I)	COVID-19 infection has demonstrated an increased risk of mental health problems in multiple domains. It was evident that depression was the most presenting psychiatric illness among the studied sample (45.6%), while generalized anxiety disorder was the second most prevalent disorder (42.1%). And suicide was found in 9.6%.
Schäfer et al. 2024	Follow-up	Germany	265 (75/187)	45.5 years (SD: 12.1)	Depression: Patient Health Questionnaire (PHQ-9); Anxiety: Generalized Anxiety Disorder (GAD-7); Somatic symptoms (Patient Health Questionnaire-15)	In total, 80% of patients experienced severe PASC at follow-up. Clinically relevant symptoms of depression, persistent somatic symptoms, anxiety and fatigue were reported by 55.8%, 72.5%, 18.9% and 89.4% of patients, respectively. Depressive, anxiety and somatic symptom severity decreased significantly over time.
Scholz et al. 2023	Cross-sectional	Switzerland	253 (29/224)	45.49 years (SD: 12.03)	Perceived social stigma: COVID-specific stigma questionnaire; Depression/Anxiety: Hospital Anxiety and Depression Scale (HADS); Perceived stress: Perceived Stress Scale (PSS-4)	Total social stigma was related to more perceived stress, more depressive symptoms, higher anxiety, and lower mental hrqol, but it was unrelated to physical hrqol after controlling for confounders.
Shachar-Lavie et al. 2023	Case-control	Israel	103 (47/56)	13.50 years (SD: 4.01)	Cognitive, emotional, and behavioral problems: Pediatric Symptom Checklist (PSC); PTSD: Child and Adolescent Trauma Screen (CATS)	Children with LC had greater exposure to COVID-19-related stressors and children with LC exhibited more memory difficulties. LC was associated with impairments in some aspects of children's memory which may relate to academic functioning, but not with higher rates of emotional-behavioral problems.
Singh et al. 2022	Cross-sectional	India	198 (129/69)	median: 41years (IQR: 18-87)	A study protocol and clinical record form (CRF)	The psychological issues patients faced were fear (41.6%), worry (40.4%), depression (31.8%), and anger (30.3%). 51% of patients reported sleeplessness.
Steinmetz et al. 2023	Prospective cohort	Germany	158 (34/124)	48.2 years (SD: 14.3)	Depression: Patient Health Questionnaire (PHQ-9); Anxiety: Generalized Anxiety Disorder (GAD-7); post-traumatic stress disorders: International Trauma Questionnaire part 1 (ITQ-1),	Psychological alterations were frequently represented: 43.4% showed a moderate or severe anxiety disorder (21.8%; 18.6%), and 30.2% (18.3%; 9%) a moderate-severe or severe depression. Signs of a post-traumatic stress disorder represented by elevated ITQ-1 scores was also observed.
Sun et al. 2024	Cross-sectional	China	498 (236/262)	19.24 years (IQR: 18-20)	Healthy Lifestyle Scale for College Students; Depression: Patient Health Questionnaire (PHQ-9); Anxiety: Generalized Anxiety Disorder (GAD-7);	Only 142 students (28.5%) showed mild symptoms of anxiety, while only 8 students (1.6%) showed moderate anxiety. In addition, 126 students (25.3%) showed mild symptoms of de-

						pression, 17 students (3.4%) showed moderate symptoms of depression, and only 1 student (0.2%) showed moderate-to-high symptoms of depression
Tanriverdi et al. 2022	Cross-sectional	Turkey	48 (22/26)	39.2 ± 7.9 years	Mood & sleep quality: Hospital Anxiety and Depression Scale, and Pittsburgh Sleep Quality Index	Anxiety, depression, and poor sleep quality were observed in 33.3%, 29.2%, and 50% of the participants.
Tarantino et al. 2022	Cross-sectional	Italy	31 (8/23)	14.1 years (SD: 2)	Post-Traumatic Stress Symptoms: Trauma symptoms checklist for children (TSCC); Depression: Patient Health Questionnaire-9 (PHQ-9); Anxiety: Generalized Anxiety Disorder-7 (GAD-7)	A high percentage of participants showed symptoms of depression (80.6%) and anxiety (61.3%). 16.2% of the sample scored positive for suicidal or self-harm ideation. Subjects presenting numbness/weakness, fatigue, brain fog, or attention problems had higher scores in depression, anxiety, and post-traumatic stress symptoms ( $p \leq 0.05$ ).
Tebeka et al. 2023	Cross-sectional	France	1095 (431/664)	≥ 18 years of age	Anxiety: Generalized Anxiety Disorder (GAD)-2 scale; Depression: Patient Health Questionnaire (PHQ)-2	Participants with PCC had higher levels of anxiety and depressive symptoms than participants infected with SARS-COV-2 infection without PCC: Measured anxiety concerned 23.3% of PCC participants versus 17.6% in the control group. Measured depression concerned 22.2% of PCC participants versus 18.0% in the control group.
Zhang et al. 2024	Retrospective cohort	USA	4306 (1774/2532)	54.62 years (SD: 15.34)	TriNetX database	Long COVID was associated with an increased risk of new onset of MHD. Long COVID was associated with major depression disorder (aHR 3.36; 95%CI 2.82 to 4.00) and generalized anxiety disorder (aHR 3.44; 95%CI 2.99 to 3.96). The increase was independent of demographics, lifestyle factors and major chronic medical conditions.

well-being of the patients?

Q 2: What factors may influence the impact of long-COVID on mental health?

## Research Methodology and Process

We based our survey on the existing research using the method of literature review. Specifically, we sourced literature from two databases, Web of Science' Core Collection and MEDLINE, using the following search terms: ("Long COVID" OR "Post-COVID-19" OR "post-acute COVID-19" OR "ongoing symptomatic COVID-19" OR "chronic COVID-19" OR "post-COVID-19 syndrome" OR "long-haul COVID-19") AND (psychological OR psychopatholog\* OR "mental health" OR depression OR anxiety OR hyperact\* OR autism \* OR emotional OR addict \* OR insomnia). As of September 15, 2024, 1,741 studies were retrieved.

Our literature inclusion criteria include: (1) a peer-reviewed article with observational study design, e.g., cohort study, cross-sectional study, etc.; (2) assessing the mental health state of the long-COVID patient by the subject's self-report, or a questionnaire, a scale, among other tools; (3) a publication in English accessible in full text. Based on these criteria, 38 studies were selected, which were published between May 2021 and August 2024. The literature search and screening processes are shown in **Figure 1**.

## Results

### Characteristics of the Studies Included

**Table 1** displays key information about the 38 studies included in the literature review. Our review encapsulates data from 19 countries on six continents, which can mirror the global impact of long-COVID. The biggest number of studies were conducted in the United States ( $n = 6$ ), followed by Germany ( $n = 4$ ), China ( $n = 3$ ), Egypt ( $n = 3$ ), and Italy ( $n = 3$ ). Among the 38 studies, 37 limited their research scope to one single country; Lüscher et al. (2023), as an exception, based their research on data from multiple countries and territories. The literature consists of 22 cross-sectional studies (including two cross-sectional comparative studies), five follow-up studies, and four cohort studies (including prospective and retrospective cohort studies), two retrospective studies, two prospective studies, one qualitative study, one case-control study, and one case series study. The majority of these studies use adult patients (over 18 years old) as subjects; only three focus on data about adolescent patients. Altogether, there are 8,681 subjects included in our survey.

Regarding the assessment tools for measuring the mental states of long-COVID patients in these studies, the Patient Health Questionnaire (PHQ-9) is the most common used to measure the depression level and the Generalized Anxiety Disorder (GAD-7) to assess the anxiety level. In addition, the Hos-

pital Anxiety and Depression Scale (HADS) and the EuroQol five-dimension five-level scale (EQ-5D-5L) are also frequently adopted by researchers.

### **The Impact of Long-COVID on Mental Health for COVID-19 Survivors**

As **Table 1** shows, the literature has mentioned a variety of mental health problems associated with long-COVID, among which depression and anxiety are the most prevalent. Specifically, 30 studies reported over 30% prevalence rates of depression symptoms, and 27 studies reported above-30% prevalence rates of anxiety symptoms among long-COVID patients. Certain studies make comparisons between the mental states of long-COVID patients and healthy individuals to find that the prevalence of moderate to severe depression and anxiety symptoms in the former is significantly higher (Cai et al., 2023; Naik et al., 2024). At the same time, Sun et al. (2024) observed that the prevalence rates of moderate to severe depression and anxiety symptoms in college student long-COVID patients are both below 4%, which are much lower than those in other long-COVID patient groups reported by other studies. The variation may be caused by the differences in sampling and assessment methods.

Furthermore, cognitive deficits, including poor concentration and memory, are also common mental health problems in long-COVID patients, as mentioned by eight studies in the literature. Four and five studies have observed the post-traumatic stress disorder (PTSD) and sleep quality decline, respectively, in COVID-19 survivors. Two studies note that long-COVID patients experienced elevated stress. It is noteworthy that 9.6% and 16.2% risk rates of suicidal or self-injury ideation in subjects were reported by two separate studies. These research findings justify the implementation of mental health evaluation among individuals with the long-COVID syndrome.

To delve into the psychological experiences of long-COVID patients, McAlearney et al. (2024) conducted in-depth interviews with 21 Americans with long-COVID symptoms and discovered that their psychological reactions are consistent with the five stages of grief in the Kubler-Ross model: denial, anger, bargaining, depression, and, for some, acceptance. The patients tended to initially deny the long-term nature of long-COVID and subsequently develop anger over the disruptions and others' misunderstandings brought on by the long-COVID syndrome. A portion of them would choose to make psychological adjustments when they realized they could not recover as quickly as expected. Long-standing illness made them feel frustrated and even develop symptoms of depression. In the end, a small number of patients accepted their altered health states and tried to adapt to a different post-COVID-19 life. This study effectively showcases the negative impacts of long-COVID on the patients' mental health by thoroughly presenting psychological challenges facing them, providing valuable insights for how to deploy targeted intervention and support for this group.

### **Factors Influencing Mental Consequences of Long-COVID**

Among the 38 studies, a portion of them include an analysis of

factors that work on the relation between long-COVID and mental health. First, most of these analyses indicate a positive relation between the severity, duration, and number of COVID-19 symptoms and the incidence of subsequent mental health problems (e.g., Giurgi-Onucu et al., 2021; Galanis et al., 2023; Li et al., 2024), even though Houben-Wilke et al.'s (2022) study finds that the incidence of PTSD, anxiety, and depression is comparable between hospitalized and non-hospitalized patients and that these emotional issues may all improve over time. Second, the development of post-pandemic mental problems is closely linked to the demographic characteristics of the patient, such as gender, age, economic status, and residential location (urban or rural). Rural females with low economic status or being unemployed are more likely to experience depression and anxiety symptoms (e.g., Sabry et al., 2023; Hameed et al., 2024; Kim et al., 2024). Among adolescent long-COVID patients, the increased home economic pressures may significantly impair their psychological adaptation ability (Shachar-Lavie et al., 2023). Regarding age distribution on this issue, some research findings suggest that older patients are more likely to develop post-pandemic psychological disorders (e.g., Schäfer et al., 2024). However, Abulsaad et al.'s (2023) study finds that there is a higher incidence of anxiety symptoms in younger patients due to their high level of exposure to social media. Third, personal psychological dispositions may also find expression in the relation between long-COVID and the mental health state of the patient. According to Bodini et al. (2024), "self-compassion" is negatively related to the depression, anxiety, and stress levels in long-COVID patients; "over-identification" can most significantly predict the increase in the levels of these negative emotions; "isolation" has the greatest explanatory power for the perception of stress; and "self-judgement" has the highest explanatory power in the dimension of anxiety. In addition, Bota et al. (2024) argued that patients who tended to adopt avoidance as the coping strategy were subject to more severe mental health challenges. Fourth, aside from personal characteristics, external factors can also affect the mental health of long-COVID patients. On one hand, limited healthcare resources available for long-COVID treatment and intervention and the public prejudices and social stigma attached to long-COVID may exacerbate the mental distress in the patients (Espinar-Herranz et al., 2023; Scholz et al., 2023). On the other hand, sound social support and emotional support from the patient's connections have proved effective in alleviating their distress and increasing their sense of well-being (Li et al. 2024; Moissoglou et al. 2024), whereas mere material support appears to have minimal comforting effects, according to Lüscher et al. (2023). Lastly, there is a marked correlation between the physical health and mental health states in long-COVID patients, which could possibly lead to a vicious cycle: depression and anxiety symptoms may intensify the perception of fatigue and physical sufferings in long-COVID patients, posing a negative impact to their quality of life (Hurtado et al., 2024); the deteriorated physical fitness can, in turn, exacerbate mental issues (Tarantino et al., 2022).

### **Discussion**

Research findings from various countries across the globe have revealed the widespread presence of long-COVID-induced

mental health issues, including anxiety and depression symptoms, cognitive deficits, and more. Individuals with long-COVID syndrome may experience tremendous worries and anxiety in fear of the risks of illness deterioration or relapse; depressive disorders are common issues among long-COVID patients, who may show signs of low-spiritedness, losses of interest, and low senses of self-worth; and cognitive deficits, such as poor concentration and memory decline, impair the everyday functioning of the long-COVID patient. Moreover, a few studies note that a sizable portion of long-COVID patients have PTSD symptoms. Furthermore, research has revealed the age, gender, and SES differences in the mental outcomes of long-COVID. In addition, other factors, including the lack of knowledge on coping mental issues on the part of the patients and social stigmatization of long-COVID and long-COVID patients, may also contribute to the mental burdens of this group.

The presence of negative mental consequences of long-COVID necessitates more active coping strategies. First off, it is imperative to improve long-COVID education and publicity for the public to increase their knowledge about the potential mental impact of long-COVID and to reduce unnecessary panic about it among them. Bodini et al.'s (2024) study suggests that casual sharing of misfortunes by COVID-19 survivors on social media can add psychological perplexities to other long-COVID patients. Second, it is important to develop in long-COVID patients the awareness of seeking professional psychological services, such as psychological counseling and cognitive-behavioral therapy, to mitigate mental pressures and accelerate psychological rehabilitation. In the meantime, healthcare institutions have the responsibility to set up specialized mental health service agencies, providing personalized psychological support and intervention for long-COVID patients, to reduce the risk of elevated anxiety or depression in them in the process of treatment. Prevention and intervention moves are also crucial for maintaining stable and sound emotions in those patients who have not developed anxiety and depression symptoms (Espinar-Herranz et al., 2023). Third, many persons with the long-COVID syndrome have encountered cost-related barriers

to accessing mental health counseling or treatment (Naik et al., 2024). Hence, the government and other stakeholders should increase investment in mental health services and optimize resource distribution to ensure that the public has easier access to these services. In addition, it is of vital importance for the long-COVID patient to adopt a healthier lifestyle, including augmented outdoor activity, to reduce the risk of developing long-COVID-related negative emotions (Tanriverdi et al., 2022; Sun et al., 2024).

The limitations of this survey should be acknowledged. Its finite scope of literature search may lead to insufficient inclusion of relevant studies. Also, our analysis results are subject to assessment bias because the majority of the studies adopted problem-specific self-report questionnaires or non-in-person channels like phone calls and online interviews in gathering information.

## Conclusion

Our analysis of the research findings of the 38 studies demonstrates the prevalence of the negative impact of long-COVID on mental health in COVID-19 survivors. Mental health issues, particularly depression and anxiety disorders, are detrimental to the patient's physical rehabilitation, largely degrading their own and their family members' quality of life. Thus, it is imperative to identify long-COVID-related mental health issues in the patients as early as possible for them to obtain legitimate intervention and support in a timely manner to circumvent the persistence or further deterioration of psychological imbalance induced by long-COVID. At present, there are no established biomarkers for diagnosing long-COVID as a major consequence of the pandemic, and long-COVID's adverse effects on physical and mental health in the public are ongoing. Future investigations should increase research on the chronic effects of long-COVID on mental health and relevant clinical diagnosis criteria, expanding the scope of studies in this area. Also, it is important to popularize knowledge about long-COVID and strengthen health management education among the public in response to this long-term global challenge. ■

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