

# **Association Between Previous Mental Health Disorders and Post- COVID-19 Conditions**

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April, 2023

**Abstract:**

The COVID-19 pandemic has proven to be challenging to many scientists and physicians due to its rapid spread and long lasting effects. The objective of this study is to determine whether high levels of psychological distress leads to increased risk of developing post-COVID-19 conditions (long COVID). A total of 55 participants from a small family practice in New York State were the sample for this study. Patient charts were reviewed to gather PHQ-9 scores and look for diagnoses of long COVID symptoms. The results did not reveal any significant relationship between mental health conditions and long COVID symptomatology.

**Introduction:**

Mental and physical health rely heavily on each other and are significantly connected and interrelated. Mental health includes our emotional, psychological, and social well being whereas physical health is the condition of one's body. Both are equally important components for overall health. Mental health illnesses are the most common health conditions in the United States with 1 in 5 Americans experiencing a mental illness in a given year, and more than 50% get diagnosed with a disorder at some point in their life (CDC, 2021). Underlying factors that can increase the severity of a mental illness include: genetics, family history, adverse life experiences, alcohol or drug use, overall life styles, and chronic medical conditions. Similar to poor physical health leading to stress and anxiety, mental illnesses, especially severe ones, can lead to poor physical health for some people. Mental illnesses also present with physical symptoms, which is why it is important to integrate and treat both physical and mental health equally (Jansen et. al, 2022).

In a study done in 2022 among university students in order to better understand the relationship between mental and physical health, it was found that both physical and mental health were related. The relationship between mental and physical health has shown that the more severe cases of depression and psychotic symptoms are related to poorer overall physical health and more severe comorbidity. Conversely, it was found that patients with physical illnesses are at higher risk for comorbid anxiety, depression, and even substance abuse. Although difficult, it is paramount that healthy lifestyles are followed in order to maintain both physical and mental health (Jansen et. al, 2022).

The COVID-19 pandemic caused by the SARS-CoV-2 virus leads to mild to moderate upper respiratory symptoms which affects daily life and activities. This disturbance can lead to

mental health diagnoses over time (Wang, 2022). COVID-19 may only affect us for a short time, but symptoms can linger for weeks or even months. This is known as long COVID.

### **What is long COVID?**

The first case of COVID-19 was reported on December 1, 2019. The virus is caused by the SARS-CoV-1 virus and has an incubation period of two to fourteen days. Exposure happens through respiratory droplets, and once exposed, symptoms can appear within two days.

Symptoms of COVID-19 include: cough, fever and chills, shortness of breath and difficulty breathing, muscle or body aches, sore throat, new loss or taste of smell, diarrhea, headache, fatigue, nausea or vomiting, runny nose, and brain fog (Wang, 2022). Some people who are infected can experience no symptoms, and others mild symptoms. However, this illness can lead to respiratory failure and lasting damage to major organs, and death. By March of 2020, the number of cases had dramatically risen to the point where hospitals had been overwhelmed and most of the world went into lockdown.

The COVID-19 pandemic caused an unprecedented health crisis around the globe. It took the lives of over six million people. On top of this excessive mortality, there are many people who have survived the acute stages, but suffer from long-term symptoms. These lingering symptoms, that sometimes can be life changing, are referred to as long COVID. The duration and characterisation of the acute phase varies: asymptomatic, mild, moderate, severe, and critical. According to the World Health Organization (WHO), the term “Post COVID-19 syndrome” was defined as “occurs in individuals with a history of probable or confirmed SARS-CoV-2 infections, usually 3 months from the onset of COVID-19 with symptoms that last for at least two months and cannot be explained by an alternative diagnosis.” Both the Centers for Disease Control and Prevention (CDC) and the National Institute for Health Excellence (NICE) have

indicated that these lingering symptoms can be experienced even by non-hospitalized individuals, any age group, even if the person was initially asymptomatic upon testing positive for COVID. Recent studies suggest that COVID develops a cytotoxic memory immune T- cell that affects the autoimmune response to fighting an infection. The rates of long COVID vary depending on multiple factors including: age, health, and vaccination status/number of vaccinations. Among those who have received two doses of COVID vaccines, the likelihood of developing long COVID was 9.5%. Those who self reported a single dose, or no vaccination history had a 14.6% likelihood of developing lingering symptoms (Alghamdi et.al, 2022).

**Respiratory symptoms:**

The epithelium of the respiratory tract is in the front line upon inhalation of the virus. Upon infection, patients may experience mild to severe upper respiratory tract symptoms such as: sore throat and coughing. However, patients with severe cases can be prone to acute respiratory disorder syndrome (ARDS) which requires intensive care. There is evidence that acute effects lead to reduced pulmonary diffusing capacity and breathing difficulties. One of the most reported symptoms is chronic dyspnea. Patients typically score below average on spirometry measures and testing which aim to test the functioning of the lungs (Alghamdi et. al, 2022).

**Musculoskeletal (MSK) Symptoms:**

Many studies have shown that patients with long COVID experience “profound fatigue.” In fact, this is the most common reported symptom among patients with long COVID. These symptoms may result from inflammatory, neurological, and psychological factors. Other

musculoskeletal symptoms include bone density reduction, muscle weakness, and joint pain. In severe cases where patients were hospitalized, 45% of them experienced generalized muscle pain especially in the lower extremity (Alghamdi et. al, 2022).

**Cognitive function:**

Cognitive functioning and memory impairment is of concern in the post-COVID phase. A study done by Cavaco et. al in 2023 aimed to examine cognitive impairments in patients one year after a COVID-19 infection. Patients that were selected for this study experienced neurological symptoms of: headaches, vertigo, sleep disturbances, and visual symptoms. Systemic symptoms included: fevers, hyposmia/anosmia, respiratory difficulty and failure, and myalgia. All participants took part in short neuropsychological evaluations, including processing speed, visual learning/memory, and verbal learning/memory functions. Patients also completed multiple self reported questionnaires pertaining to failures in perception, memory, and motor functions. This was evaluated using the CFQ on a range of 0 to 4. The higher the score, the more perceived cognitive difficulties in one's daily life. Hospital Anxiety and Depression Screening (HADS) was used to screen for anxiety and depression, and ranges from 0 to 21. Higher HADS scores are indicative of anxiety and depression. The results of this longitudinal study found that 1- year after infection, 52.7% of individuals had abnormal performances on at least two or three cognitive tests. At the follow up, 33.3% of the participants made significant cognitive complaints (Cavaco et. al, 2023).

**The association between predisposed mental disorders and COVID-19 conditions:**

In a study done in 2020 by Dominic L. Sykes et. al, patients from a large teaching hospital were studied upon discharge. All patients had confirmed COVID RT-PCR pneumonia. Upon discharge and follow up, all patients received chest X-rays (CXR) and standardized clinical assessments. The study reported the patients symptoms in clusters of occurrence. The most common reported symptom at follow ups was “breathlessness” compared to their pre-COVID state. At least 60% of people reported increased difficulty with breathing, 51.5% reported myalgia, 47.8% anxiety, 37.3% low mood, 39.6% extreme fatigue, and 35.1% of people reported sleep disturbance. Females were significantly more likely to report anxiety, low mood, and sleep disturbances, and memory impairment. Three symptom clusters were formed based on the most reported symptoms. Cluster A included: Myalgia and fatigue; Cluster B: low mood, anxiety, and sleep disturbance; Cluster C: memory impairment, attention deficit, and cognitive impairment. One must consider the biopsychosocial effects of COVID-19 and how they may precipitate into long lasting symptoms that affect both physical and mental health (Sykes et. al, 2021).

To further understand the effects of mental health disorders on post- COVID 19 infections, the association of pre-diagnosed depression, anxiety, worry, perceived stress, and loneliness on post COVID-19 was examined. A study done by Wand et. all (2022) aimed to determine whether high levels of psychological distress such as: depression, anxiety, perceived stress, and loneliness before COVID SARS-CoV-2 infection was associated with higher risks of developing post COVID- 19 syndrome or long COVID. Baseline distress was tested using the 4-item patient health questionnaire (PHQ-4s). This consisted of a 2- item depression measure (PHQ-2) and 2- item anxiety measure (GAD-2). Responses ranged from 0 (not at all) to 3 (nearly

every day). Scores of 3 or higher are indicative of probable depression or anxiety. The questionnaire that assessed for perceived worry about the pandemic included: “How worried are you about COVID 19?” Responses included: not at all, not very worried, somewhat worried, and very worried. To assess loneliness, the UCLA Loneliness Scale was used to determine companionship and feelings of isolation and support. The results of this study indicated that all types of distress at high levels were associated with increased risk of post COVID-19 conditions or long COVID. Participants who had two or more predisposed psychological factors were 50% more likely to experience post COVID-19 symptoms compared to those who did not experience high levels of psychological distress (Wang and Chavarro, 2022).

#### **Clinical assessments and validity:**

The patient health questionnaire (PHQ) can have multiple items. As later introduced, this study utilized the PHQ-9. These assessments aim to evaluate common mental disorders such as depression. These can be used over time to determine the severity of initial symptoms of depression, and monitor as well as alter treatments if needed. The questions aim to understand levels of hopelessness, trouble concentrating, appetite changes, sleep, and suicidal ideations. Responses range from 0= not at all, 1= several days, 2= more than half the days, and 3= nearly everyday. Analysis include: mild, moderate, moderately severe, and severe depression levels. Although overall reliable, studies have shown significant differences in scores across many socio demographic groups (Rahman et. al, 2022).

Another tool is the Generalized Anxiety Disorder scale with 7 items. This screening tool is used to assess the presence and severity of Generalized Anxiety Disorder (GAD). This assessment asks how often and how severely people have experienced anxiety in the last two



weeks. Questions include review of symptomatology like feeling nervous, trouble concentration, trouble relaxing, and irritability. Similar to the PHQ screenings, responses range from 0-3. Although this tool has proved to be overall reliable, studies have shown significant differences in scores across many socio demographic groups (Rahman et. al, 2022).

To further gain knowledge on this topic, this study will examine the association between mental health and post-COVID conditions. A patient's mental health will be dependent on their PHQ-9 and GAD screening scores. Since there is no direct way of measuring the severity of COVID-19 symptoms, the study will assess this based on other factors such as: number of office visits with the patient's primary care provider, symptoms consistent with long COVID, and hospitalizations. . The aim of this study is to investigate a relationship between the severity of mental health and the duration and seriousness of post-COVID symptoms. Throughout, focus will also be given to the role an integrated healthcare setting plays on the overall health of a patient. It is hypothesized that patients with more chronic mental health issues will experience longer and more serious symptoms after testing positive for COVID-19.

### **Methodology:**

To begin, an IRB approval was obtained from Union College. The IRB was submitted to the Community Care Physicians group for approval. In this study, the charts of 200 patients in a small family practice in New York were reviewed. A query was done to obtain a list of patients who had been diagnosed with both mental health disorders like anxiety or depression and have been experiencing symptoms of long COVID for more than six months. ICD 10 diagnosis codes that were searched for included: Post COVID cough, shortness of breath, long COVID. Of these 200 patient charts, 55 patient charts were selected as they had an overlap of both a mood disorder

and a symptom of long COVID. The charts were reviewed in depth and the most recent PHQ-9 score was noted. Symptom scores were then assigned to each patient depending on 1) the number of follow up appointments, 2) lingering cough, 3) fatigue and muscle aches, 4) shortness of breath, and 5) hospital visits or hospitalization. Each patient's age, gender and PHQ-9 was accounted for. To assess the severity of long COVID symptoms, a total score was assigned to each person based on the symptom scores mentioned above. The data was then run using the Statistical Package for the Social Science (SPSS). Confidentiality of the patients were protected throughout the study.

### **Results:**

**Based on the data collected, previous mental health diagnoses did not significantly impact symptoms of long COVID.** The results of the experiment are shown in table 1 below. The relationship between age and symptom score is significant (p- value= 0.001) and a Pearson Correlation value of .435 (43.5%), meaning symptom score increases as age increases. The relationship between PHQ-9 scores and age were significant at a p- value of 0.002 and Pearson Correlation of -0.421 (42.1%). The lower the age, the higher the PHQ-9 scores. Gender and PHQ-9 scores did not have a statistically significant effect on long COVID symptoms (P- value= .720 and .161).

Table 1: Correlations between gender, age, PHQ 9 scores and symptoms

|         |                     | Gender | Age     | PHQ9    | Symptom |
|---------|---------------------|--------|---------|---------|---------|
| Gender  | Pearson Correlation | 1      | -.074   | .114    | .050    |
|         | Sig. (2-tailed)     |        | .597    | .411    | .720    |
|         | N                   | 54     | 54      | 54      | 54      |
| Age     | Pearson Correlation | -.074  | 1       | -.421** | .435**  |
|         | Sig. (2-tailed)     | .597   |         | .002    | .001    |
|         | N                   | 54     | 54      | 54      | 54      |
| PHQ9    | Pearson Correlation | .114   | -.421** | 1       | .193    |
|         | Sig. (2-tailed)     | .411   | .002    |         | .161    |
|         | N                   | 54     | 54      | 54      | 54      |
| Symptom | Pearson Correlation | .050   | .435**  | .193    | 1       |
|         | Sig. (2-tailed)     | .720   | .001    | .161    |         |
|         | N                   | 54     | 54      | 54      | 54      |

\*\* . Correlation is significant at the 0.01 level (2-tailed).

### Discussion:

In this study, we aimed to understand the relationship between pre-infection of a mental disorder and symptoms of long COVID. It is hypothesized that patients with more chronic mental health issues will experience longer and more serious symptoms after testing positive for COVID-19. Previously collected data for patients at Community Care Physicians was de-identified and used. The mental health status of a patient pre and post-COVID was determined based on PHQ-9 and GAD screenings scores on record. Variables such as number of office visits, symptoms consistent with long COVID, and hospitalization due to a COVID diagnosis were considered in order to evaluate the severity and duration of post-COVID symptoms.

**Implications:**

Overall, the data in this study did not support the hypothesis that patients with more chronic mental health issues will experience longer and more serious symptoms after testing positive for COVID-19. After running a statistical analysis, the p-values for the relationship between PHQ-9 and symptoms score (.161) as well as gender and symptom score (.720) revealed to be non-significant (meaning there was no statistically significant difference). However, age and PHQ-9 scores were related and significant (p-value = 0.002). This reveals that age and PHQ-9 scores have an inverse relationship. PHQ-9 scores are higher among those who are younger. In a study done by Twenge in 2011, it is mentioned that this modern life is causing increasing stress among the young population. Considering this increase was very rapid, it is unlikely that it was due to genetic reasons. Instead, these generational changes were embedded in cultural shifts such as decreases in social interactions which lead to depression. The younger generations are more likely to seek help compared to people who are older in age. This is because advocacy has increased, and there is less stigma around mental health compared to previous generations (Twenge, 2011).

Another relationship that was found to be significant was between age and symptom score with a p-value of 0.001 and a 43.5% correlation. Long COVID is of particular concern among older people, ages 65 and up. In addition, COVID illness exacerbates chronic conditions that occur commonly in older people, such as cardiovascular disease, respiratory disease, neurodegenerative conditions, and functional decline. It is also likely that these elders lost a significant other during the pandemic, which would affect their mental health. The reason COVID-related deaths among the older populations have decreased is because of vaccination rates (Mansall, 2022). A meta analysis found that vaccinations have decreased rates of severe

COVID 19 symptoms during illness by 81% and full vaccination prevents death by 82% (Sobczak, 2022).

**Limitations:**

One limitation of this study is that it was focused on one family practice in a wealthy city. This means that this population has access to better healthcare and medications. One such medication includes Paxlovid. These populations also receive proper preventative care, decreasing their likelihood of hospitalization and long COVID altogether. Considering their wealth, there is less economic burden and stress in their life, most likely leading to overall lower PHQ-9 scores compared to a more vulnerable population. These advantages are not consistent with underrepresented populations who live in more poor communities and have limited access to healthcare. Future studies should expand on diverse populations.

In the previous section, the benefits of COVID vaccinations and statistics were mentioned. In this study, it did not account for who was vaccinated or not. Whether a patient is vaccinated or not will change the overall trajectory of their treatment and symptoms. In the future, studies should aim to gain participants from the same vaccination status. These patients also had various different underlying health conditions that were not accounted for. Long COVID illnesses are not only dependent on age and vaccination status, but also on underlying diseases (Wang, 2022). Another factor that was not controlled for was the number of times patients were diagnosed with a COVID diagnoses. It should be studied whether more than one diagnosis and reinfection has effects on long COVID.

**Conclusions:**

In this study, long COVID outcomes were assessed based on pre-diagnosed mental illnesses. It was hypothesized that those with chronic mental illnesses will experience more severe symptoms of long COVID. Mental health was assessed using PHQ-9 scores were statistically compared to long COVID symptoms. The data did not support the hypothesis, but the relationship between age and PHQ-9 scores and age and symptom score were significant. Future studies should control for multiple variables such as vaccination status, age, and underlying health conditions. It would also be beneficial to expand the participants population into multiple areas and compare data among different socio-economic backgrounds. This study helped clarify the relationship between the severity of mental health in comparison with age, and supported increased symptomology post-COVID with increased age. Age seemed to be an important factor.

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