**The latest data on COVID’s harm to our brains.**

***Many COVID victims will suffer long term neurological harm.***

Not everyone who is a COVID victim will have long term mental problems, but numerically, even those who had mild infections, can have long term, serious mental issues.

According to Mr. Walter Koroshetz, director of the National Institute of Neurological Disorders and Stroke, part of the National Institutes of Health. “The big surprise was the people who never required hospitalization that are having persistent trouble.”

It is also not clear how many people will eventually recover and how many will be left with devastating long-term effects.

We will not know the answer to our questions until 5 years, or 10 years, and longer have passed.

What we know now is that COVID victims who had gone to hospital and been put onto a ventilator have suffered the most debilitating mental effects.

The research at New York University disclosed that among the patients who were severely infected, around 50% did not recover sufficient mental health to live a normal life and/or return to work.

Reported by Megan Hosey, a rehabilitation psychologist at Johns Hopkins Medicine, says about a third of ICU patients who have acute respiratory failure have symptoms that are similar to those of traumatic brain injury.

Bottom line, if you are lucky enough to have avoided COVID to date, in public - stay a safe distance from strangers. Wear a good face mask when you must mingle in crowds or are near other humans. You don’t know whether anyone near you (and vaccinated) may be a carrier/spreader, and can unintentionally infect you and anyone who gets near a spreader.

Wishing all good physical and mental health.

**SOURCE:**

[***https://www.nationalgeographic.com/science/article/how-does-covid-19-affect-the-brain-a-troubling-picture-emerges***](https://www.nationalgeographic.com/science/article/how-does-covid-19-affect-the-brain-a-troubling-picture-emerges)

**How does COVID-19 affect the brain? A troubling picture emerges.**

***Researchers find that people who only suffered mild infections can be plagued with life-altering and sometimes debilitating cognitive deficits.***

***By Emily Mullin, National Geographic, August 18, 2021***

Hannah Davis contracted COVID-19 in March 2020, the early days of the pandemic. At the time, the New Yorker was a healthy, 32-year-old freelance data scientist and artist. But unlike many people who come down with the disease, Davis’s first sign of infection wasn’t a dry cough or fever. Her first symptom was that she couldn’t read a text message from a friend. She thought she was just tired, but the fuzziness she felt didn’t go away after a full night’s sleep.

More neurological issues followed. She developed sudden and severe headaches. Her attention span suffered. She couldn’t watch TV or play video games. She had trouble concentrating on everyday tasks like cooking. She’d leave a pot on the stove and forget about it until she smelled food burning. She failed to look both ways while crossing the street, narrowly missing traffic. She’d never had any of these issues before COVID-19.

Davis is among **a large portion of COVID-19 patients—possibly as high as 30 percent, according an estimate from the National Institutes of Health—who suffer some type of neurological or psychiatric symptoms**. Even more troubling is that for many of these individuals, like Davis, these cognitive issues can linger for weeks or months after the initial infection.

Last year, dozens of hospitals and healthcare systems across the country opened post-COVID clinics to help patients who had been admitted to intensive care units with severe COVID-19. But as the pandemic has dragged on, those clinics have filled with people who were never hospitalized but suffer lingering symptoms, including brain fog and other cognitive issues.

“The expectation was that all these people in the ICU were going to have really long protracted recovery periods,” says Walter Koroshetz, director of the National Institute of Neurological Disorders and Stroke, part of the National Institutes of Health. “**The big surprise was the people who never required hospitalization that are having persistent trouble**.” Koroshetz is co-leading a study at NIH to understand why some COVID-19 patients recover faster than others and to learn the biological reasons why others don’t get well even months later.

A picture is starting to emerge of how COVID-19 causes these cognitive issues. **What’s less clear is how many people will eventually recover and how many will be left with devastating long-term effects.**

A year and a half later, Davis can only work a few hours a day because of lingering brain fog, short-term memory loss, and other cognitive issues. She’s seen a dozen or so medical specialists and has been diagnosed with post-viral dysautonomia, a nervous system disorder that causes dizziness, rapid heartbeat, and fast breathing when rising from sitting or lying down. It’s sometimes treated with fludrocortisone, a corticosteroid, or midodrine, a blood pressure drug.

“I’ve never experienced anything like this in my life,” Davis says. “Your body just it feels like it's breaking down. You lose your sense of self.”

**The Great British Intelligence Test**

Before the pandemic began, cognitive neuroscientist Adam Hampshire and his colleagues at Imperial College London were planning a large, nationwide survey called the Great British Intelligence Test. Their goal: to understand how cognitive ability varies among the population and how factors like age, alcohol consumption, or occupation might affect cognition. The test, which is anonymous and takes about a half hour to complete, involves a questionnaire and exercises to measure planning and reasoning skills, working memory, and attention span.

With the help of the BBC, the team launched the survey in January 2020. As the pandemic began to unfold in the U.K., Hampshire and his colleagues realized they had a unique opportunity to capture cognitive data on both coronavirus patients and healthy people. In May 2020, they updated the test to include questions about experiences with COVID-19.

Out of more than 81,000 participants who took the questionnaire and test between January and December 2020, nearly 13,000 people reported COVID-19 infections varying from mild to severe. Among those, results revealed that they had cognitive issues compared with a group that not suffered from COVID-19.

“On the worst extreme of the spectrum, **people who had gone to hospital and been put onto a ventilator showed the largest underperformance cognitively speaking**,” Hampshire says.

These individuals had more trouble with reasoning, problem solving, and spatial planning on the test compared to people of their same age group and educational backgrounds who hadn’t been hospitalized with COVID-19. The difference was similar to the average cognitive decline seen over 10 years of aging. The findings were published in The Lancet on July 22.

**The ICU brain**

Though Hampshire’s findings sound startling, it’s fairly common for patients admitted to the ICU to suffer lasting cognitive issues. Megan Hosey, a rehabilitation psychologist at Johns Hopkins Medicine, says about **a third of ICU patients who have acute respiratory failure have symptoms that are similar to those of traumatic brain injury.**

One reason is because **patients are often sedated in the ICU to reduce anxiety and discomfort, such as that caused by mechanical ventilators. Sedatives slow down brain activity and in doing so can cause delirium, a sudden change in mental status that leads to confusion and disorientation. Patients have trouble focusing or they may not know where they are; it’s a condition that can last hours, days, or even weeks**.

“What we know is that the longer somebody is delirious, the worse their cognitive picture will look in the long-term,” Hosey says.

But sedation doesn’t explain all cases of neurological and cognitive issues in long-COVID patients, she says. Many COVID-19 patients don’t need ventilators, and others, like Davis, are never hospitalized.

Some previously hospitalized COVID-19 patients have such severe neurological and cognitive problems that they can’t participate in follow-up phone screenings about how they feel, says Jennifer Frontera, a neuro-critical care specialist at NYU Langone Health.

**In a study published July 15, Frontera and her colleagues screened for neurological problems in patients admitted to the hospital with severe COVID-19. Of 382 patients, 50 percent reported that they had impaired cognition and a diminished capacity to carry out daily activities, walk, or take care of themselves six months after being discharged**. Of those who worked prior to being hospitalized, **47 percent could not return to their jobs six months later.**

The researchers also found that **a subset of the 382 COVID-19 patients who had no previous neurological syndromes experienced strokes and seizures while in the hospital.** At the same time, individuals with a history of neurological problems were at higher risk for developing new ones while hospitalized with COVID-19, Frontera says. **The findings underscore just how much damage COVID-19 can do to the nervous system, especially those who develop severe disease**.

**Unexpected effects**

In the U.K. cognition survey, a portion of those who had a confirmed case of COVID-19 but were not hospitalized had cognitive deficits as well, though not as severe as the hospitalized group. **Other studies confirm that people who experienced “mild” or “moderate” COVID-19 can have lingering cognitive issues that have a profound impact on daily life.**

Davis and others like her have formed the Patient-Led Research Collaborative, a self-organized group of long COVID-19 patients who are collecting data on neurological and other lasting symptoms. In a peer-reviewed paper published on July 15, Davis’s group found that out of nearly 3,800 people surveyed who suffered from long COVID, 85 percent reported “brain fog” — which the authors define as poor attention, problem-solving, executive-functioning, and decision-making. Only a small portion of those—317 people—were previously hospitalized with severe COVID-19.

**In one post-COVID-19 clinic at Northwestern Memorial Hospital in Chicago, researchers found that many individuals with long COVID were never hospitalized yet had neurologic symptoms lasting longer than six weeks**. Out of 100 patients, the **most common neurologic manifestations were brain fog, and numbness and tingling, which affected 81 percent and 60 percent of patients** respectively, according to a study published in March. These individuals also performed worse in attention and working-memory cognitive tasks compared to people their age who hadn’t gotten sick with COVID-19.

**Probing the brain**

Other viruses like West Nile, Zika, herpes simplex, and the virus that causes chickenpox and shingles are known to directly infect the brain. When COVID-19 patients first started reporting cognitive and neurological side effects last year, scientists wondered if SARS-CoV-2 might do the same thing.

Researchers started probing the brains of people who died of COVID-19 looking for traces of the virus. But brain tissue is hard to come by. Few people donate their brains to research, and strict protocols for handling potentially infectious brain tissue make studying it even more difficult. As a result, these studies are small, often involving just a handful to a few dozen patients.

While a few studies have detected the presence of the virus in neurons and their supportive glia cells, which hold neurons together like glue, scientists now think it’s unlikely that SARS-CoV-2 infects brain cells, at least in large enough quantities to cause neurological damage. If the virus is present there at all, it’s likely in very small amounts or is contained within the brain’s blood vessels.

A Columbia University study of 40 people who died of COVID-19 found no evidence of viral RNA or proteins in samples of patient brain cells. The results were published in April in the journal Brain. The authors suggest that previous reports of virus detected in brain cells may be due to contamination during the autopsy.

“The fact that SARS-CoV-2 is potentially causing these cognitive effects at a distance makes it a bit unusual,” says Christopher Bartley, a postdoctoral fellow in immunopsychiatry at the University of California, San Francisco, who wasn’t involved in the Columbia study.

**Biological mechanisms**

**If SARS-CoV-2 doesn’t infect brain cells, how is so destructive to cognition? There are two leading hypotheses**.

The first is that the **infection somehow triggers inflammation in the brain**. Some COVID-19 patients have suffered encephalitis, or swelling of the brain, which can cause confusion and double vision, and in serious cases, speech, hearing, or vision problems. If left untreated, patients can develop cognitive problems. Viruses like West Nile and Zika can cause encephalitis by directly infecting the brain cells, but how COVID-19 may lead to brain inflammation is less clear.

An immune response run amok, known as autoimmunity, might be to blame for some instances of inflammation throughout the body, including the brain. When the immune system is fighting a disease like COVID-19, it unleashes antibodies to do battle against the infection. But sometimes a person’s immune system becomes hyperactive and instead starts making self-attacking antibodies, known as autoantibodies, which can contribute to inflammation and blood clots. These autoantibodies have been found in the cerebrospinal fluid of COVID-19 patients with neurological symptoms.

In the Columbia study, researchers found clusters of microglia—special immune cells in the brain whose job is to clear out damaged neurons—that appeared to be attacking healthy neurons. The phenomenon is called neuronophagia. Most of these rogue microglia were in the brain stem, which regulates heartbeat, breathing, and sleeping. The researchers think these microglia may get activated by signaling molecules called inflammatory cytokines found in patients with severe COVID-19. These molecules are supposed to help regulate the immune system, but some people’s bodies release too many inflammatory cytokines in response to a viral infection.

When researchers at Stanford looked at brain tissue from eight patients who died of COVID-19, they also observed signs of inflammation compared to 14 control brains. Using a technique called single-cell RNA sequencing, they found that hundreds of genes associated with inflammation were activated in brain cells from COVID-19 patients compared to controls.

They also noted molecular changes in the cerebral cortex, the part of the brain involved in decision-making and memory that suggested signaling imbalances in neurons. Similar imbalances have been seen in patients with Alzheimer’s disease. The results were published in Nature in June.

A second explanation for cognitive issues is that **COVID-19 may restrict blood flow to the brain and deprive it of oxygen.** **In patients who have died of COVID-19, researchers have found evidence of brain tissue damage caused by hypoxia, or the lack of oxygen.**

**“The brain is an organ that requires a lot of oxygen to do its job,”** says Billie Schultz, a physiatrist at the Mayo Clinic in Rochester, Minnesota, who specialized in rehabilitating stroke and traumatic brain injury patients before COVID-19 hit.

Other symptoms that accompany post-COVID-19 syndrome—pain, fatigue, and shortness of breath—can negatively affect cognition too, Schultz says. “It’s not just a brain issue; it's a multi-system body issue that needs to be addressed.”

**The next health crisis**

Schultz is hopeful that many people experiencing persistent cognitive issues from COVID-19 will eventually improve. Many stroke and traumatic brain injury patients experience spontaneous recovery, in which the brain heals itself within three to six months.

But others worry that cognitive issues caused by COVID-19 may lead to dementia. At the Alzheimer’s Association International Conference in July, scientists presented research showing that hospitalized COVID-19 patients had similar blood biomarkers, neurodegeneration, and inflammation to those with Alzheimer’s disease. The research has not yet been peer-reviewed.

Heather Snyder, vice president of medical and scientific relations at the Alzheimer's Association, cautions that the findings don’t necessarily mean someone who gets COVID-19 is more likely to develop Alzheimer’s or another type of dementia. “We’re still trying to understand those associations,” she says.

**For now, there are no specific treatments for COVID-related brain fog, memory loss, and other cognitive effects. Instead, doctors are using cognitive therapy, occupational therapy, or speech-language pathology to treat symptoms**. Many studies, like the NIH one, are trying to understand the underlying mechanisms of cognitive dysfunction in long COVID patients in hopes of identifying potential treatments.

“We and others are collecting anecdotal data from patients on what has helped them, but we are far from definitive therapeutics,” Frontera says.

**In the U.S. alone, millions of people have developed lasting cognitive and neurological problems long after an initial COVID-19 infection. Some of these patients may be permanently disabled and need long-term care.** “My concern is that we're going to have huge numbers of the population who aren't able to function at their cognitive baseline. They can't go back to work, or at least not to what they did before,” Frontera says. “We haven’t even thought of the long-term implications. It could be an incredible blow to the economy.”

Davis says **the scariest part about COVID-19’s cognitive effects is that people of all ages and health status are affected. “This is something everyone is at risk for, and it's completely debilitating.”**

Editor's Note: This article has been updated to correct the number of patients in studies regarding COVID-19 and cognition.