How does coronavirus kill? Clinicians trace a deadly path

As the number of confirmed cases of COVID-19 surges past 2.2 million globally and deaths among infected patients in the hundreds of thousands, doctors and scientists are trying to grapple with how the virus is attacking the body. The earliest signs of SARS-CoV-2 infection—fever, dry cough, sore throat, loss of smell and taste, or head and body aches—may suggest an upper respiratory infection. But as the number of cases continues to grow, so do the number of deaths, with one model predicting that a quarter of all COVID-19 patients could end up in intensive care units and a fraction of those will die.

In serious cases, SARS-CoV-2 lands in the lungs and can do deep damage there. But the virus, or the body’s response to it, seems to have spread to other parts of the body, including the heart, brain, and kidneys. It is even starting to show up on the gut.

The coronavirus is activating a cytokine storm, in which the body’s immune response becomes hyperactive and wreaks havoc on the lungs and other organs.

But although the immune response seems to be the main driver of severe disease, doctors say other factors could be contributing to organ failure. And although some patients recover unscathed, others are left with life-changing consequences.

For example, doctors say COVID-19 can lead to strokes, kidney failure, heart attacks, and encephalitis—a swelling of the brain that can cause inflammation and tissue damage.

A 58-year-old woman with COVID-19 developed encephalitis, resulting in tissue damage in the brain (arrows). A cross section shows widespread edema (green), inflammation (red), and disruption of the blood-brain barrier. The map shows the devastation COVID-19 can inflict on the body. It will take time to see how many people are left with long-term consequences after recovery from infection.

Infection may also lead to blood vessel constriction. Reports are emerging of ischemia in the lower gastrointestinal tract, which can cause heart attacks, strokes, seizures, confusion, and brain inflammation. Doctors say these conditions are more likely driving liver damage.

Permanente, Northern California, co-editor of Medicine.

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