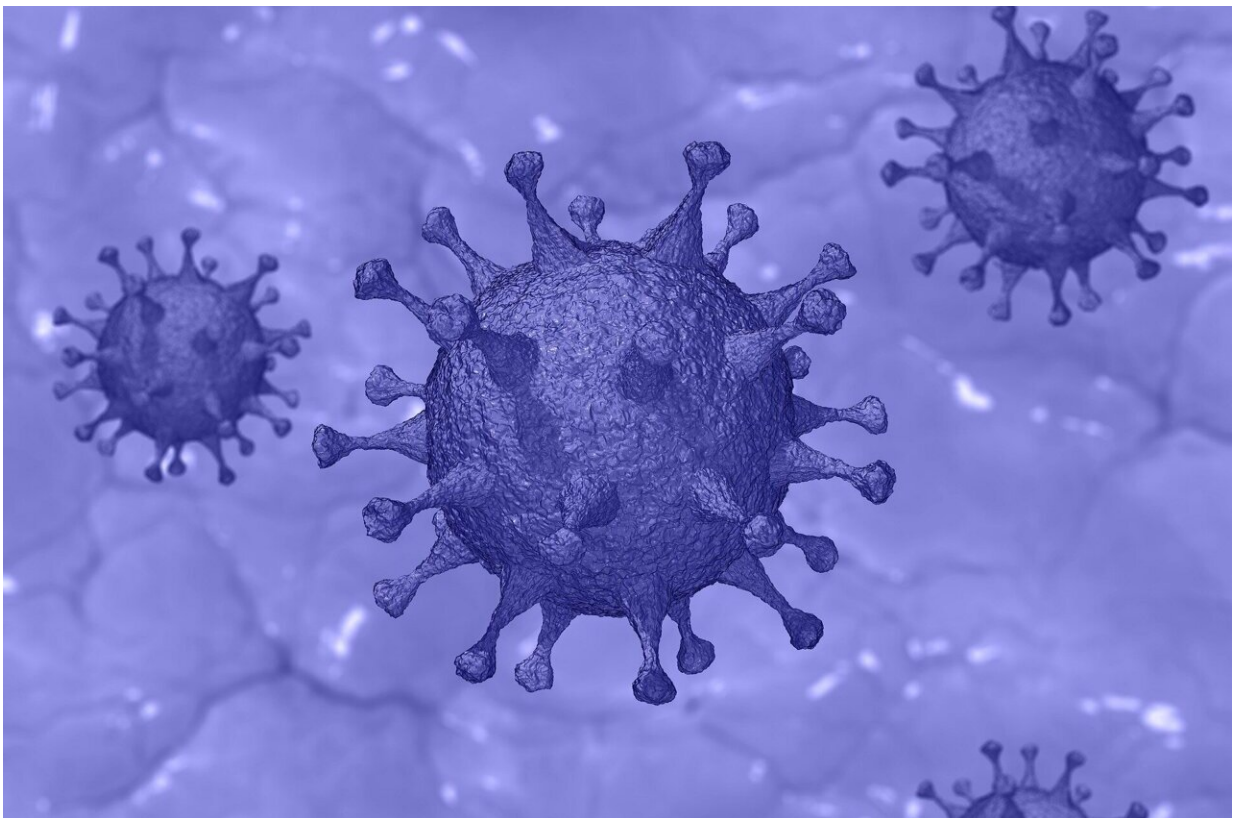


COVID-19: Bacterial co-infection is a major risk factor for death, ICU admission and mechanical ventilation

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Bacterial co-infection is a major risk factor for death, intensive care unit admission and mechanical ventilation, according to a multi-center,

retrospective cohort study published in the journal *Critical Care* and led by University of Alabama at Birmingham researchers.

Coronavirus disease 2019, or COVID-19, has killed more than 6.3 million people worldwide.

This recent study of 13,781 COVID-19 inpatient encounters from 2020 to 2022 found that bacterial co-infection in the blood, known as bacteremia, is a greater risk factor for death, intensive care unit admission and [mechanical ventilation](#) than previously described [risk factors](#) for COVID-19 severity and mortality, such as advanced age, male sex or various comorbidities.

The study reviewed COVID-19 inpatient encounters at UAB Hospital and at Ochsner Louisiana State University Health Shreveport hospitals and divided them into three groups: confirmed bacterial co-infection, as measured by a blood test at 48 hours after admission; suspected bacterial co-infection in patients receiving antimicrobials; and no bacterial co-infection.

Bacterial co-infection is a known major source of sickness and death in the context of other respiratory viral infections such as influenza, parainfluenza or RSV. However, it has been unclear regarding the frequency of bacteremic co-infection in COVID-19 and the impact it has on clinical outcomes.

"Although confirmed bacteremic co-infections are rare in COVID-19, less than 4 percent of inpatient admissions, our results show that COVID-19 patients with these co-infections have a staggering 25 percent risk of death at 30 days in UAB patients and a similar risk of 20 percent at Ochsner Louisiana State University Health Shreveport, or OLHS," said Amit Gaggar, M.D., Ph.D., UAB Department of Medicine Division of Pulmonary, Allergy and Critical Care Medicine. Gaggar, in

collaboration with the Hugh Kaul Precision Medicine Institute director, Matthew Might, Ph.D., and infectious disease physician-scientist Nathaniel Erdmann, M.D., Ph.D., co-led the study.

"These results strongly suggest an underappreciated interaction between bacterial pathogens and the COVID-19 virus, SARS-CoV-2, and their impact on clinical outcomes," co-senior author Erdmann added.

Specifically, the researchers found that the in-hospital mortality for COVID-19 co-infections of 26 percent at UAB and 22 percent at OLHS exceeded that of the suspected co-infection (UAB, 24 percent; OLHS, 12 percent) and the no co-infection groups (UAB, 5.9 percent; OLHS, 5.1 percent). Furthermore, a control group of 1,703 UAB inpatients with community-acquired [bacteremia](#) during a period before the COVID-19 pandemic had a 5.9 percent in-hospital mortality rate.

The researchers also identified laboratory trends associated with COVID-19 bacterial co-infection—a neutrophil-to-lymphocyte ratio of 15 or greater, and the Systemic Inflammatory Response Syndrome, or SIRS, criteria of abnormal white blood cell counts or a heart rate greater than 90 beats per minute. These can help health care providers discriminate COVID-19 bacterial co-infections within 24 hours of admission.

"These results emphasize the role of bacteria in SARS-CoV-2 mortality, and highlight the potential for neutrophil-to-lymphocyte ratio as a rapid and easily available prognostic biomarker of bacterial coinfection and, relatedly, disease severity," said co-senior author Might.

Strengths of this study were the two large, demographically diverse, independent cohorts—UAB reflects an academic hospital and Level I trauma center serving five surrounding states, and OLHS includes encounters from rural, suburban and academic medical centers across

the state of Louisiana. Both cohorts overall were well matched for patient age, race, sex and inpatient length of stay.

"One of the novel opportunities of the COVID-19 pandemic has been the seismic shift in collected and searchable data captured by electronic medical record, or EMR, systems. This resource, in combination with the collaborative spirit of experts from UAB and OLHS, provides the bedrock for biomedical informatic studies that can produce clinically useful observations for the betterment of patients," said primary and corresponding author of the study Michael John Patton, an aspiring clinician and biomedical informatician in UAB's Medical Scientist Training Program for M.D.-Ph.D. trainees.

More information: Michael John Patton et al, COVID-19 bacteremic co-infection is a major risk factor for mortality, ICU admission, and mechanical ventilation, *Critical Care* (2023). [DOI: 10.1186/s13054-023-04312-0](https://doi.org/10.1186/s13054-023-04312-0)

Provided by University of Alabama at Birmingham

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