

Obesity and metabolic syndrome are risk factors for severe influenza, COVID-19

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Metabolic syndrome increases the risk of severe disease from viral infection, according to a review of the literature performed by a team of researchers from St. Jude Graduate School of Biomedical Sciences and the University of Tennessee Health Science Center, both in Memphis. The research appears this week in the *Journal of Virology*, a publication of the American Society for Microbiology.

Metabolic syndrome is a cluster of at least 3 co-occurring conditions that raise the risk of heart disease, stroke and type 2 diabetes mellitus (T2DM). These conditions include excess abdominal fat, [high blood pressure](#), excess blood sugar, abnormalities of lipids (including excess triglycerides and cholesterol), [insulin resistance](#) and a proinflammatory state.

Multiple studies have shown that obesity is associated with increased severity of influenza A, higher viral titers in exhaled breath and prolonged transmission of the virus, according to the report. Changes in the viral population may abet the emergence of more pathogenic influenza variants, according to the report. Despite the fact that influenza vaccines generate robust antibody titers in obese subjects, obesity doubles the likelihood of developing influenza.

As with influenza virus, the Centers for Disease Control and Prevention recently recognized obesity as a risk factor for severe illness caused by SARS-CoV-2. "This is not surprising because excess body weight and fat deposition apply pressure to the diaphragm, which further increases the

difficulty of breathing during a viral infection," the researchers write.

But the risk goes beyond the burden of excess weight. A recent study highlighted in the literature review looked at 174 [diabetes patients](#) with confirmed cases of COVID-19. The study found that these patients were at significantly higher risk for severe pneumonia compared to non-diabetic COVID-19 patients. CT scans revealed a greater severity of lung abnormalities in these patients.

There was also a profound increase in serum IL-6 levels, a predictive biomarker for disease severity, the investigators write. These data imply that SARS-CoV-2 causes severe disease in obese patients and in those with T2DM by inducing bilateral pneumonia and a cytokine storm that damages the lung epithelial-endothelial barrier. (The epithelium lines surfaces exposed to the outer environment, such as the respiratory tract, the endothelium lines inner pathways such as those of the vasculature.)

However, one hypothetical risk for patients with T2DM who have hypertension or heart disease appears not to be a problem, after all, according to the report. These patients are commonly treated with angiotensin-converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARBs). These increase expression of ACE2, the receptor that SARS-CoV-2 uses to gain entry into cells.

Clinicians and researchers were initially concerned that ACE inhibitors and ARBs could promote adhesion and entry of SARS-CoV-2 into host cells, thereby increasing the risk of severe COVID-19. Contrary to concerns, multiple studies now suggest that ACE inhibitors and ARBs do not lead to poorer outcomes in COVID-19 infection.

"Future research should seek to [determine] how metabolic abnormalities increase viral pathogenesis, as this information will play an essential role in global preparedness against emerging seasonal and

pandemic virus strains," the investigators conclude.

ASM is keeping the pulse on the SARS-CoV-2 pandemic with the COVID-19 Research Registry of top-ranked research articles curated by experts. In the eye of a pandemic, this curated database will ensure that scientists, journalists and the public have an efficient way to find the timeliest and most valuable SARS-CoV-2/COVID-19 research from the latest journal articles and preprints.

Provided by American Society for Microbiology

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