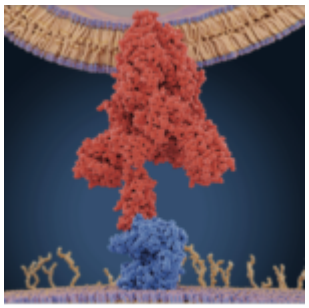
Why are hypertension and diabetes patients at high risk of severe COVID-19?



Retrospective analysis of COVID-19 patient history showed that 12-22% and 23-30% of severe COVID-19 patients also had diabetes and hypertension, respectively (Guan et al., 2020; Yang et al., 2020; Zhang et al., 2020). This and other reports suggest that hypertension and diabetes are associated with a high risk of severe COVID-19 (Fang et al., 2020; Diaz et al., 2020).

The link between hypertension, diabetes and SARS-CoV-2 is angiotensin-converting enzyme 2 (ACE-2). ACE-2, expressed on lung, intestine, kidney and blood vessel epithelial cells, is one of the co-receptors SARS-CoV2 uses to infect cells. Levels of ACE-2 are higher in diabetes and hypertension patients compared to "healthy" individuals. This is due to the natural pathogenesis of the diseases, and treatment of these patients with either ACE-1 inhibitors or angiotensin-receptor antagonists, which further increases ACE-2 levels (Fang et al., 2020; Diaz et al., 2020). Based on this, researchers hypothesise that high levels of ACE-2, as observed in diabetes and hypertension patients, facilitate increased viral entry and replication leading to severe disease.

Interestingly, some researchers suggest treating severe COVID-19 with angiotensin receptor blockers (ARBs). At first, this may seem counterintuitive, however, they suggest treating with ARBs will increase ACE-2 which will then lead to increased levels of vasodilator angiotensin 1-7, reducing SARS-CoV2 pathogenesis (Gurwitz et al., 2020). This hypothesis is yet to be tested and proven.

Article by Cheleka AM Mpande

References:

- Diaz et al., 2020. Hypothesis: angiotensin-converting enzyme inhibitors and angiotensin receptor blockers may increase the risk of severe COVID-19. Journal of Travel Medicine
- Fang et al., 2020. Are patients with hypertension and diabetes mellitus at increased risk for COVID-19 infection ? The Lancet Respiratory Medicine
- Guan et al., 2020. Clinical Characteristics of Coronavirus Disease 2019 in China. New England Journal of Medicine
- Gurwitz et al., 2020. Angiotensin receptor blockers as tentative SARS-CoV-2 therapeutics. Drug Development Research

- Yang et al., 2020. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. The Lancet Respiratory Medicine
- Zhang et al., 2020. Clinical characteristics of 140 patients infected with SARS-CoV-2 in Wuhan, China. Allergy
- Science Translational Medicine Blog Post: Angiotensin and Coronavirus by Derek Lowe