

# PERSPECTIVES IN HYPERTENSION

## The incidence of new-onset hypertension and new-onset Type 2 diabetes during or after SARS-CoV-2 infection



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This review explores the intricate connection between COVID-19 and the emergence of new-onset hypertension and type 2 diabetes (T2D). The COVID-19 pandemic has had a sweeping impact on global health, introducing not only immediate clinical challenges but also long-term health risks that remain incompletely understood.<sup>1</sup> While initially recognized for its respiratory complications, SARS-CoV-2 has since been linked to a broad range of systemic issues, including cardiovascular and metabolic disorders.

Mounting evidence suggests that COVID-19 may lead to or reveal new-onset hypertension and T2D, both during the acute infection phase and in the post-COVID-19 period. Understanding these implications is essential, as they could guide clinical management strategies and enhance patient outcomes.

To systematically investigate this relationship, a comprehensive literature search was conducted using trusted databases like PubMed/MEDLINE and Google Scholar. By focusing on keywords such as acute COVID-19, post-COVID-19, new-onset hypertension, and new-onset T2D in adults over 18, data was gathered from studies conducted between December 2019 and August 2022. This literature review synthesizes findings on the prevalence, risk factors, and underlying mechanisms connecting COVID-19 to these new-onset conditions.

### Incidence of New-Onset Hypertension

Numerous studies highlight the incidence of new-onset hypertension among COVID-19 patients. The

review includes key findings, such as a retrospective cohort study by Chen et al., which found that 61% of COVID-19 patients experienced significant blood pressure increases during hospitalization. The research points to elevated angiotensin-II levels as a potential factor in this rise, as SARS-CoV-2 interacts with angiotensin-converting enzyme 2 (ACE2), leading to an imbalance in the renin-angiotensin system (RAS).<sup>2</sup> (Fig 1)

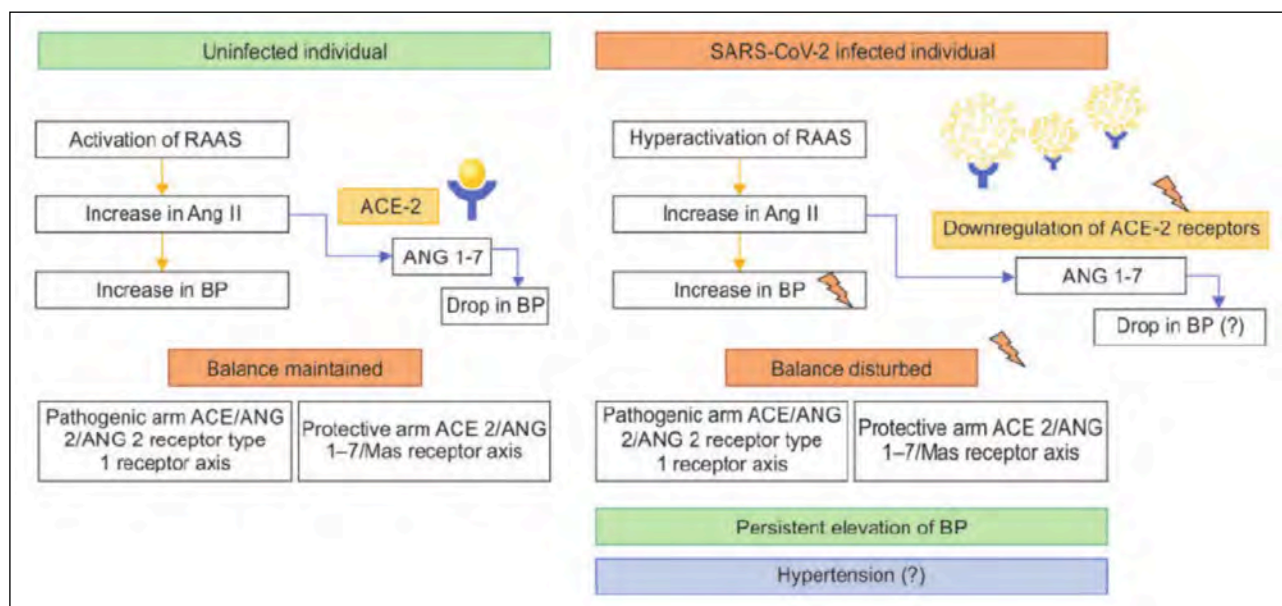
Additionally, indirect evidence suggests a possible link between mRNA COVID-19 vaccinations and hypertension-related adverse events. A case series has reported instances of severe hypertension following immunization.<sup>3</sup> While further research is required to fully understand this association, these cases hint that the immunological and inflammatory responses triggered by both SARS-CoV-2 and its vaccines might contribute to blood pressure irregularities.

### Incidence of New-Onset Type 2 Diabetes

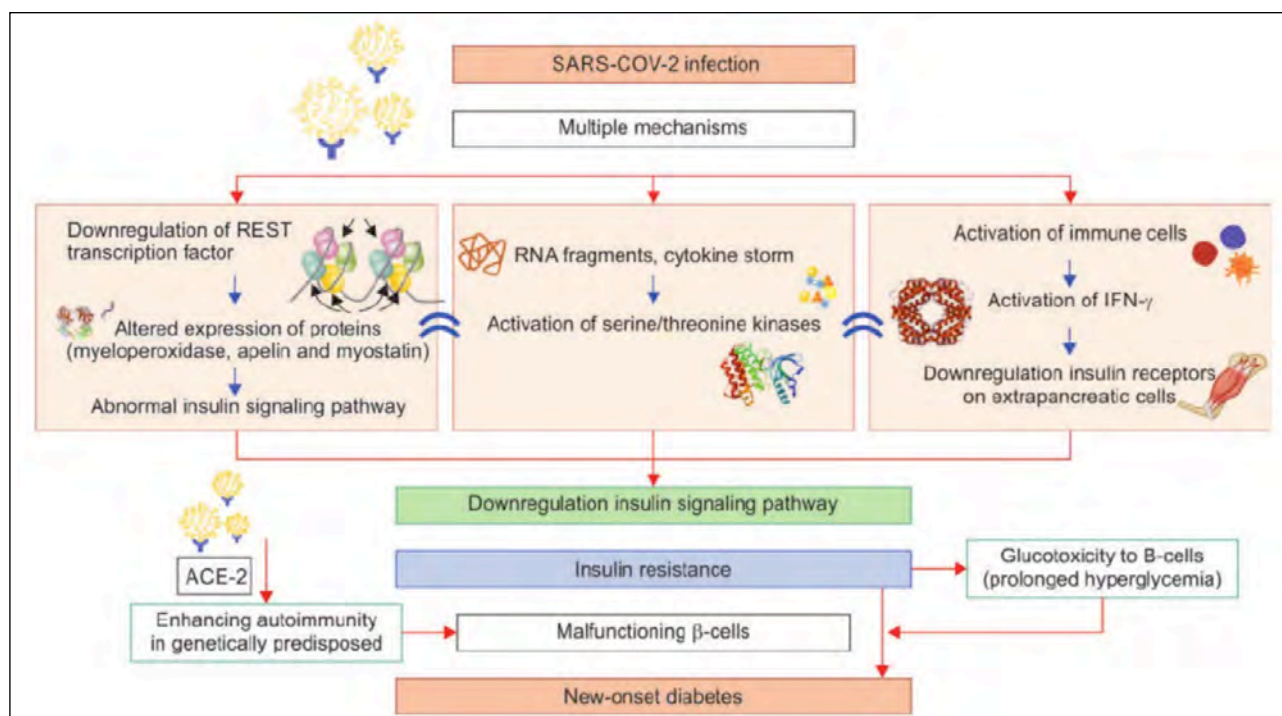
Evidence also points to a concerning rise in new-onset diabetes associated with COVID-19. For example, a meta-analysis by Shrestha et al. found that 19.7% of individuals developed new-onset diabetes following COVID-19 infection. Many studies reviewed were retrospective observational studies, showing varying percentages of patients with newly diagnosed diabetes, which strengthens the hypothesis of a potential link between COVID-19 and new-onset T2D.<sup>4</sup>

The mechanisms behind this connection likely involve viral-induced  $\beta$ -cell dysfunction and insulin

**Figure 1:** Proposed mechanisms for SARS-CoV-2 infection-induced new-onset hypertension



**Figure 2:** Proposed mechanisms for SARS-CoV-2 infection-induced NOD



resistance, further intensified by immune system and renin-angiotensin system (RAS) dysregulation. There's also evidence that the hypothalamic-pituitary-adrenal (HPA) axis might contribute by increasing counter-regulatory hormones, which can worsen metabolic control in infected patients. <sup>5</sup> (Fig 2)

**Risk Factors and Screening Recommendations**

Currently, no specific predictive risk factors for new-onset hypertension or diabetes related to COVID-19 have been identified in the literature. However, it is essential to closely monitor patients

who have had COVID-19, as they may show higher rates of multi-organ dysfunction after discharge. This calls for proactive screening during and post-recovery to facilitate timely intervention and reduce the risk of long-term complications. <sup>6</sup>

With new-onset diabetes reportedly occurring more frequently than hypertension, prioritizing diabetes screening in post-COVID-19 patients could be beneficial. <sup>4</sup> In newly diagnosed patients, especially those with very high blood glucose levels, infection screening is recommended, as individuals

with new-onset diabetes post-COVID-19 may face higher risks of adverse outcomes, including increased mortality.<sup>7</sup>

In conclusion, there is a pressing need for healthcare providers to recognize and address the potential for new-onset hypertension and diabetes linked to COVID-19. Evidence suggests that these conditions may appear during both the acute and post-acute phases of infection, posing significant risks of unexpected health complications.

### Why was the work done?

The growing emergence of new-onset hypertension and diabetes among COVID-19 patients underscores the need to better understand how SARS-CoV-2 might trigger or exacerbate these conditions. This work is crucial, as both hypertension and T2D significantly increase the risk of cardiovascular disease, kidney complications, and mortality, particularly when left undiagnosed or unmanaged. Given the global impact of COVID-19, identifying whether these conditions are directly related to the virus—or if they reveal underlying vulnerabilities that SARS-CoV-2 aggravates—is essential for public health.

Furthermore, as COVID-19 has highlighted the interconnectedness of various health systems within the body, this research provides insights that go beyond immediate clinical care. It aims to help healthcare professionals recognize potential long-term sequelae in COVID-19 survivors, informing approaches to preventive care and management strategies that could alleviate future health burdens on patients and healthcare systems.

### What should be done next?

To address remaining uncertainties, future research should focus on long-term cohort studies and randomized controlled trials that could clarify the mechanisms linking SARS-CoV-2 to new-onset hypertension and T2D. These studies can investigate viral effects on organs like the pancreas, cardiovascular system, and central nervous system, all of which contribute to metabolic and blood pressure regulation. Additionally, researchers could explore genetic and environmental factors that may predispose certain individuals to these new-onset conditions, helping to identify those at higher risk.

Developing clear screening guidelines for post-COVID-19 patients would also be a valuable next step. Implementing regular monitoring for blood pressure and blood glucose levels among those recovering from COVID-19, particularly those with severe cases, may prevent complications and ensure early intervention. Public health strategies could further benefit from comprehensive educational initiatives on the risks of COVID-19-related hypertension and diabetes, promoting awareness among patients and clinicians alike.

Ultimately, advancing this body of research will aid in building robust, evidence-based frameworks for managing COVID-19's long-term health impacts, equipping healthcare systems to meet the needs of those affected by post-COVID-19 conditions effectively.

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