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Currie et al.[1] that this topic is not fully explored and support the suggestion that lower urinary tract symptoms, urine microscopy and culture data should be included in future studies.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request. ■

References

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Authors' reply

Sir,

Thank you for the opportunity to respond to the letter from Leavitt and colleagues.[1] We would like to thank them for their interest in our study[2] and their valuable observations. We agree with Leavitt and colleagues that a similar underlying pathophysiology (endothelial damage) may exist in both pre-eclampsia (PE) and COVID-19, which may explain most of their common clinical manifestations.

Other authors have suggested that the signs and symptoms of PE present in some pregnant women with COVID-19 could be a consequence of the placental dysfunction due to intravascular inflammation associated with the infection, leading to a prothrombotic state in the placenta.[3] This hypothesis is supported by the higher rates of maternal vascular malperfusion features observed from placentas of women with COVID-19.[4] Although this hypothesis has biological plausibility, previous studies have shown a correlation between placental histological findings consistent with maternal underperfusion and anti-angiogenic status.[5] By contrast, in our study we did not find increased soluble fms-like tyrosine kinase-1/placental growth factor values in most of the women with COVID-19 and signs and symptoms of PE. For this reason, we believe that the placental malperfusion due to COVID-19 is unlikely to be the main aetiology of the PE-like syndrome.

Thus, we agree with Leavitt and colleagues that the shared pathophysiology between COVID-19 and PE is probably related to immunothrombosis and decreased alpha-1-antitrypsin (AAT) and that further research is needed to better understand the causes of PE and PE-like syndrome in order to achieve appropriate treatments for these conditions. ■

References

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Re: Pre-eclampsia-like syndrome induced by severe COVID-19: a prospective observational study

Common pathophysiology of pre-eclampsia and severe COVID-19?

Sir,

Mendoza et al.[1] recently published a prospective cohort study examining clinical features of pre-eclampsia among pregnant women with confirmed SARS-CoV-2 infection. Five of eight women (62.5%) with severe COVID-19 had pre-eclampsia or a pre-eclampsia-like syndrome, and the one subject who did not undergo delivery during the study had resolution of the pre-eclampsia-like syndrome after recovery from COVID-19. Since all five of these subjects did not have evidence of pre-eclampsia before the diagnosis of severe COVID-19 pneumonia, we agree with Mendoza and colleagues' assessment of a similar underlying pathophysiology of pre-eclampsia and severe COVID-19.[1]

One common denominator in the pathophysiology of pre-eclampsia and COVID-19 is endothelial injury. A hallmark of pre-eclampsia is disrupted placentation, which leads to endothelial dysfunction and end-organ damage. SARS-CoV-2 infects endothelial cells and COVID-19 lungs demonstrate endothelial cell injury, microthrombi and angiogenesis.[2] It is thought that the endothelial damage in both pre-eclampsia and COVID-19 can lead to multi-organ dysfunction. Furthermore, both disorders have an increased risk of non-cardiogenic pulmonary oedema and venous thromboembolism.

In the context of endothelial injury, we propose three additional shared elements of pre-eclampsia and COVID-19. There is increasing evidence that neutrophil extracellular traps (NETs), which are extruded DNA and histones released by neutrophils to destroy extracellular bacteria, play an important role in COVID-19-related immunothrombosis and endothelial damage.[3] Interestingly, NETs have also been implicated in non-COVID-19-associated pre-eclampsia and intrauterine growth