



# Diabetes mellitus and SARS-CoV-2-related mortality: the impact of acute hyperglycemic crises and some further considerations

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Dear Editor,

We have read with great interest the recently published systematic review and meta-analysis authored by Wu et al. [1], demonstrating that the presence of diabetes mellitus (DM) increases the odds for mortality in the context of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection by 75%. Unfortunately, as the authors clearly state in their limitations section, lack of access to data regarding diabetes type, diabetes medications and complications did not permit further subgroup analyses that could be extremely useful [1].

We would like to emphasize on another aspect of SARS-CoV-2 infection among patients with DM, the triggering of acute hyperglycemic crises, either diabetic ketoacidosis (DKA) or hyperosmolar hyperglycemic state (HHS). In a recently published case series, Hoe Chan et al. described the presentation and clinical course of 6 patients with DM who developed DKA and HHS in the context of SARS-CoV-2 infection [2]. Notably, 4 out of 6 patients required mechanical ventilation, while the same proportion of patients died due to disease [2]. According to recent evidence, patients with DM and SARS-CoV-2-related ketosis are older, with a

greater prevalence of coronary artery disease and hypertension, while they also have greater in-hospital stay, compared to non-diabetic patients that develop SARS-CoV-2-related ketosis [3]. In some cases, SARS-CoV-2-induced DKA may even be the first clinical presentation of undiagnosed DM [4]. Based on the knowledge that patients with DM feature greater odds for death due to infection compared to non-diabetic patients, it may be deduced that the complication with an acute hyperglycemic crisis will further worsen overall prognosis [1]. However, according to a recent retrospective analysis from the UK, patients with DM who develop DKA due to disease are more likely to survive compared to those patients that are not complicated by an acute hyperglycemic crisis [5].

The questions that inevitably arise are whether underlying antidiabetic treatment has a real impact on the occurrence of either DKA or HHS and if the type of diabetes really plays a role for the development of an acute hyperglycemic crisis. For example, there is increased concern regarding the risk of DKA with the continuation of the use of sodium-glucose-co-transporter 2 inhibitors during illness, or the risk of dehydration with the use of metformin or glucagon-like peptide-1 receptor agonists, which could eventually lead to DKA/HHS.

Therefore, it would be interesting to know in future, large, observational studies the proportion of patients that developed DKA/HHS in the context of SARS-CoV-2 infection, the underlying treatment and the outcome of disease. Such studies could provide us with useful insights into clinical practice, which could eventually lead to optimization of treatment strategy either to infected patients or to patients being at high risk of infection, both in in-hospital and in outpatient setting.

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## Compliance with ethical standards

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**Ethical approval** The article does not contain any studies with human subjects or animals performed by any of the authors.

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## References

1. Wu ZH, Tang Y, Cheng Q (2020) Diabetes increases the mortality of patients with COVID-19: a meta-analysis. *Acta Diabetol.* <https://doi.org/10.1007/s00592-020-01546-0> (**published online ahead of print, 2020 Jun 24**)
2. Hoe Chan K, Thimmareddygar D, Ramahi A, Atallah L, Baranetsky NG, Slim J (2020) Clinical characteristics and outcome in patients with combined diabetic ketoacidosis and hyperosmolar

hyperglycemic state associated with COVID-19 :a retrospective, hospital-based observational case series. *Diabetes Res Clin Pract* 166:108279

3. Li J, Wang X, Chen J, Zuo X, Zhang H, Deng A (2020) COVID-19 infection may cause ketosis and ketoacidosis. *Diabetes Obes Metab.* <https://doi.org/10.1111/dom.14057> (**published online ahead of print, 2020 Apr 20**)
4. Chee YJ, Ng SJH, Yeoh E (2020) Diabetic ketoacidosis precipitated by COVID-19 in a patient with newly diagnosed diabetes mellitus. *Diabetes Res Clin Pract* 164:108166
5. Alkundi A, Mahmoud I, Musa A, Naveed S, Alshawwaf M (2020) Clinical characteristics and outcomes of COVID-19 hospitalized patients with diabetes in the United Kingdom a retrospective single centre study. *Diabetes Res Clin Pract* 165:108263 (**published online ahead of print, 2020 Jun 10**)

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