Long-term blood sugar history predicts risk of severe COVID-19 among diabetics

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People with type 2 diabetes who contract COVID-19 are nearly 50% more likely to wind up in intensive care if they have poorly managed their blood sugar levels over the long-term than those with better long-

term glycemic control, according to a study using anonymized health care data. The study, which looked at several potential impacts to COVID-19 severity among diabetics, also calculated a lower risk for patients using the common diabetes-control medication metformin, or a combination of metformin and insulin, or corticosteroids.

"We find that two- to three-year longitudinal glycemic levels better indicate the risk of COVID-19 severity than measurements which look at a shorter period of time," said Deepak Vashishth, corresponding author, professor of biomedical engineering, and director of the Center for Biotechnology and Interdisciplinary Studies at Rensselaer Polytechnic Institute. "We hope these insights aid physicians in better treating and managing high-risk patients."

"Evaluation and management of COVID-19-related severity in people with type 2 diabetes" looked at records for more than 16,000 people with type 2 diabetes and COVID-19 between 2017 and 2020, and was published in *BMJ Open Diabetes Research & Care*.

Type 2 diabetes patients are unable to regulate the amount of the sugar glucose in their bloodstream without medication and managing their diet. Chronic high blood-sugar levels, typically tracked as the percentage of hemoglobin A1c (HbA1c) found in the blood, can damage a variety of functions, including the circulatory, nervous, and immune systems.

Poor glycemic control creates a reaction that causes molecules known as advanced glycation end-products (AGEs) to accumulate, deteriorating the quality of bone over time, and Vashishth, an expert in bone, researches the impact of diabetes on bone. At the time the SARS-CoV-2 pandemic began, his research team was investigating whether measurements of longitudinal glycemic control – measures of blood-sugar levels averaged over two to three years – could provide a more accurate predictor of bone fracture risk among diabetics than the current

standard predictor, which relies on measurements of bone mineral density.

AGEs are known to contribute to increased oxidant stress and inflammation, which are risk factors in COVID-19 and other respiratory illnesses. The team reasoned that the same longitudinal glycemic control measurement they were testing as a predictor of bone fracture risk might be useful in predicting the severity of COVID-19, said Bowen Wang, first author and a doctoral student in Vashishth's lab.

Wang divided the records of type 2 diabetic patients in the study into two groups, those with "adequate" longitudinal glycemic control ranging from 6 to 9%, and those with "poor" glycemic control of 9% or above over two to three years. His analysis of the two groups revealed that those with poor glycemic control were 48% more likely to require treatment in an intensive care unit. By another measure, a 1% increase in longitudinal HbA1c is directly associated with a 12% increase in the risk of landing in the ICU.

Other statistically significant findings showed that diabetics who were taking metformin when they contract COVID-19 face a 12% lower risk of visiting the ICU, those on metformin and insulin have an 18% lower risk, and those prescribed corticosteroids have a 29% lower risk.

"People knew that diabetes was a risk factor for COVID-19-related outcomes, but not all diabetic patients are the same. Some people have a longer history of diabetes, some have more severe diabetes, and that has to be accounted for," said Wang. "What this study does is to better stratify the level of diabetes within the population, so diabetic patients aren't treated as a single population without any differences among them."

More information: Bowen Wang et al, Evaluation and management of

COVID-19-related severity in people with type 2 diabetes, *BMJ Open Diabetes Research & Care* (2021). DOI: 10.1136/bmjdrc-2021-002299

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