

# COVID-19 and metabolic syndrome: could diet be the key?

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In the current COVID-19 pandemic, governments mandate social distancing and good hand hygiene, but little attention is paid to the potential impact of diet on health outcomes. Poor diet is the most significant contributor to the burden of chronic, lifestyle-related diseases like obesity, type 2 diabetes and cardiovascular disease.<sup>1</sup> As of 30 May 2020, the Centers for Disease Control and Prevention reported that among COVID-19 cases, the two most common underlying health conditions were cardiovascular disease (32%) and diabetes (30%).<sup>2</sup> Hospitalisations were six times higher among patients with a reported underlying condition (45.4%) than those without reported underlying conditions (7.6%). Deaths were 12 times higher among patients with reported underlying conditions (19.5%) compared to those without reported underlying conditions (1.6%).<sup>2</sup> Two-thirds of people in the UK who have fallen seriously ill with COVID-19 were overweight or obese and 99% of deaths in Italy have been in patients with pre-existing conditions, such as hypertension, diabetes and heart disease.<sup>3</sup> These conditions, collectively known as metabolic syndrome, are linked to impaired immune function,<sup>4</sup> and more severe symptoms and complications from COVID-19.<sup>5</sup>

A major factor that drives the pathophysiology of metabolic syndrome is insulin resistance,<sup>6</sup> defined as an impaired biological response to insulin, the hormone that regulates blood glucose levels. The dysregulation of blood glucose levels plays an important role in inflammation and respiratory disease. A study of patients with COVID-19 with pre-existing type 2 diabetes showed that those with better regulated blood glucose control fared better than those with poor blood glucose control.<sup>7</sup> Specifically, well-controlled blood glucose (glycaemic variability within 3.9–10.0 mmol/L) was associated with reduced medical interventions, major organ injuries and all-cause mortality during hospitalisation, compared with individuals with poorly controlled blood glucose (glycaemic variability exceeding 10.0 mmol/L). Another study showed hospitalised patients with hyperglycaemia treated with insulin infusion had a lower risk of death from COVID-19 than patients without insulin infusion, likely due to reduced inflammatory mediators.<sup>8</sup>

The most significant factor that determines blood glucose levels is the consumption of dietary carbohydrate, that is, refined carbs, starches and simple sugars. However, the official dietary recommendations of most Western countries advocate for a reduced (low) fat, high-carbohydrate diet, which can exacerbate hyperglycaemia. These dietary

guidelines form the basis of menus in nursing homes and hospital wards where people with COVID-19 and pre-existing metabolic syndrome are undergoing recovery and respite.

The problem is not only confined to nursing homes and hospitals. As people self-isolate at home, many are stockpiling non-perishable staple foods that are cheap such as (carbohydrate-rich) pasta, bread, rice and cereal.<sup>9</sup> Our food supply is dominated by highly processed, packaged foods; 71% of available food in the USA is classified as 'ultra-processed'.<sup>10</sup> Food and beverages such as pizza, doughnuts and fruit juices and other sugary drinks are likely to drive hyperinsulinaemia and inflammation, especially in those with metabolic syndrome.

Since the world is facing the rapid transmission of a novel virus, there has been little opportunity to conduct trials on whether patients with COVID-19 fare better on low-carbohydrate diets compared with other diets. However, there is robust evidence that restriction of dietary carbohydrate is a safe and effective way to achieve good glycaemic control and weight loss, and reduce the need for medication in the management of type 2 diabetes.<sup>11–12</sup> A systematic review comparing low-carb diets to low-fat diets showed that the low-carb diets were superior for achieving glucose control, as well as for limiting cardiovascular risk factors in the short and long term for people with type 2 diabetes.<sup>13</sup>

There has been a reluctance to accept the benefits of low-carbohydrate diets, mainly because of the contradiction to official dietary guidelines which recommend that carbohydrates make up between 45 and 65 percent of total daily calories, but significant progress has been made in recent years. For example in 2018, Diabetes Australia released a position statement stating there was reliable evidence that lower carb eating can be safe and useful in reducing blood glucose levels, reducing body weight and managing heart disease risk factors such as raised cholesterol and raised blood pressure.<sup>14</sup> Further, in 2019 the American Diabetes Association and in 2020 Diabetes Canada, both endorsed low carbohydrate diets as a viable option to improve glycaemia and the potential to reduce medications for individuals with type 2 diabetes.<sup>15–16</sup>

There are some medical institutions leading the way. One US-based hospital in West Virginia has answered calls to improve the food environment for its patients by removing all sugary drinks from its vending machines and cafeterias.<sup>17</sup> The Jefferson Medical Center is also one of the first



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hospitals in the USA to offer low-carb meals to its patients with diabetes. Tameside Hospital in Manchester became the first in Britain to remove all added sugar from the meals it prepares for visitors and health service workers and it has taken sugary snacks and fizzy drinks off its menu.<sup>18</sup>

Restriction of dietary carbohydrates is a simple and safe intervention which results in rapid improvements in glycaemic control and can be implemented alongside usual care in a medical or domestic setting. While the pathophysiology of COVID-19 is multifactorial, insulin resistance is among the strongest determinants of impaired metabolic function. Since 88% of the US population is metabolically unhealthy,<sup>19</sup> the extent to which it contributes to the severity of COVID-19 infection is likely to be significant. Therefore, the adoption of dietary advice for people with underlying metabolic syndrome as proposed in the UK,<sup>20</sup> should be more widely endorsed by governments and policy makers globally, to mitigate the burden of pre-existing metabolic disease in those who contract COVID-19, now and into the future.

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