

# Severe Diabetic Ketoacidosis After the Second Dose of mRNA-1273 COVID-19 Vaccine

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## Keywords

COVID-19, vaccine, diabetic ketoacidosis, diabetes

Administration of mRNA-1273 messenger RNA (Moderna) COVID-19 vaccine is known to be associated with side effects, including myocarditis and pericarditis.<sup>1</sup>

We report a rapid onset of severe diabetic ketoacidosis and transient profound insulin resistance in a 24-year-old female with type 1 diabetes after administration of the second dose of the COVID-19 vaccine. This patient developed severe nausea 15 hours after vaccination, and blood glucose rose above 500 mg/dL. Despite multiple boluses of insulin via her insulin pump and changing the insulin pump delivery site, the patient remained severely hyperglycemic.

Upon presentation to the emergency department, the patient was tachycardic, tachypneic, and overweight (BMI 26 kg/m<sup>2</sup>); the remainder of the physical exam was unremarkable. Laboratory data were consistent with diabetic ketoacidosis: serum glucose 505 mg/dL, bicarbonate 14 meq/L, anion gap 27, large urine ketones, hemoglobin A1c 12.0%. White cell count was elevated (16.56 K/mm<sup>3</sup>; neutrophils 84%), but infectious workup was unrevealing: negative COVID-19, no bacteria on urinalysis, and computed tomography of the lungs demonstrated non-specific discoid atelectasis of the lower lobes. Notably, the patient's home insulin total daily dose was 45 units/d; however, during the hospitalization, the patient was initially profoundly insulin resistant, requiring more than 220 units of intravenous regular insulin in the first 24 hours. On the third hospital day, insulin infusion requirements decreased to 1 unit/h, the diabetic ketoacidosis and leukocytosis resolved, and the patient was transitioned back to her subcutaneous insulin pump.

A bidirectional relationship between COVID-19 infection and diabetes has been previously reported.<sup>2</sup> Anecdotally, many people living with type 1 diabetes reported elevation of glucose levels after COVID-19 vaccine shots.<sup>3</sup> However, this is the first reported episode of diabetic ketoacidosis immediately after administration of a COVID-19 vaccine. While it is impossible to prove causality in this case between the vaccine and diabetic ketoacidosis or transient insulin resistance, we feel that it is important to highlight the possibility to other clinicians. Rare instances of acute inflammatory conditions have been described shortly after COVID-19 vaccine

administration, as have cases of new-onset hyperosmolar hyperglycemic state and transient insulin resistance.<sup>4</sup> Moreover, it is well-established that inflammatory states can acutely worsen peripheral insulin resistance and exacerbate hyperglycemia.<sup>5</sup> Given that the second COVID-19 injection triggers a potent immediate innate immune response followed by an adaptive immune response, it stands to reason that for some individuals this response may be profound.<sup>6</sup>

In conclusion, although we cannot prove causality between COVID-19 vaccination and diabetic ketoacidosis, a plausible mechanism exists between the two. Therefore, it may be prudent for clinicians to warn at-risk people, such as those living with type 1 diabetes, to test their glucose more frequently and increase insulin dosing temporarily after vaccination.

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