

For the Primer, visit doi: 10.1038/s41572-020-0180-2

➔ **Diabetic ketoacidosis (DKA) is the most common hyperglycaemic emergency in people with diabetes mellitus and results in the triad of events of hyperglycaemia, ketosis and metabolic acidosis.**

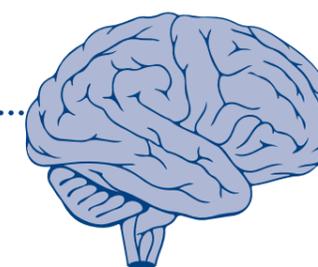
MECHANISMS

In T1DM and T2DM, insulin deficiency is accompanied by elevation of counter-regulatory hormones

DIAGNOSIS

DKA frequently presents with a short history, and symptoms — which include hyperglycaemia, polyuria and polydipsia — usually develop over a few hours. Abdominal pain is present in ~60% of patients; mental status and level of consciousness vary between individuals depending on the severity of hyperglycaemia and acidosis. Various international guidelines suggest that the presence of hyperglycaemia and acidosis and positive ketone tests confirm a diagnosis, although the methods of documenting ketosis (urine versus blood) vary.

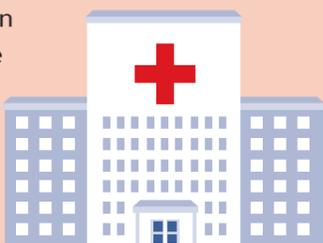
! The low pH due to acidosis can lead to neurological dysfunction, leading to coma and, if untreated, death



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EPIDEMIOLOGY

The incidence of DKA is 13–80% in both adults and children with type 1 diabetes mellitus (T1DM). The incidence of DKA as the initial presentation of T2DM (known as ketosis-prone T2DM) is increasing worldwide, with an incidence of 11% in children, whereas the incidence in adults is unknown.



! Precipitating factors include infection, acute coronary syndromes, insulin omission or issues of pump malfunction

Insulin deficiency leads to increased hepatic glucose production and reduced glucose uptake in peripheral tissues, leading to hyperglycaemia

Free fatty acids are oxidized in the liver to ketones

Glucose, ketones and free fatty acids

High levels of counter-regulatory hormones lead to increased lipolysis, releasing large quantities of free fatty acids, as well as reduced insulin action

Individuals with DKA exhibit deep and laboured breathing, often with a 'fruity' odour indicative of excess acetone

Accumulation of ketoacids decreases serum bicarbonate levels and leads to the development of metabolic acidosis

OUTLOOK

Several strategies have been proposed to reduce DKA events, including early screening, close follow-up of high-risk individuals (those with multiple admissions for DKA), availability of telephone support from diabetes specialist nurses and targeted programmes to educate parents and communities. In some parts of the world, efforts to ensure easy availability of insulin at an affordable price are needed.

Rx MANAGEMENT

The goal of therapy is to correct acidaemia, restore circulatory volume and normalize blood glucose concentrations and electrolyte disturbances. Most people are treated initially with intravenous insulin. A 'two-bag' method of fluid replacement is often used — intravenous fluid without dextrose initially and, upon volume correction, infusion with dextrose correction to prevent hypoglycaemia caused by the insulin therapy. Upon resolution of DKA and once patients are eating and drinking normally, maintenance therapy is implemented with subcutaneous insulin.

Severe hyperglycaemia and high ketone concentrations cause osmotic diuresis