Ketones & DKA

What's actually happening — and where people with diabetes actually live

Two very different metabolic states

Physiological ketosis

Normal. Beneficial. Happens all the time.

When it occurs:

-- Exercise (aerobic zones 1-2)
-- Fasting or overnight metabolism
-- Normal fat burning

What's happening:

Fat breaks down, liver makes ketones
Muscles burn them as fuel. No danger.

0.1 - 3.0 mmol/L is normal range

Non-diabetic athletes experience these levels regularly.

≠

not the same

Classical DKA

Dangerous. Rare. Requires specific conditions.

In classical DKA, all three at once:

1. Insufficient insulin
2. High glucose
3. Ketones >3.0 mmol/L -- sustained

What's different:

Insufficient insulin, loop unchecked
Kidneys overwhelmed, acidic blood

Note: eDKA is an exception -- glucose may appear normal. See note below.

High glucose or ketones alone is not DKA.

PROGRESSION

DKA takes time -- and signals distress the whole way

Progression varies -- these are not fixed timelines

Early (typically hours 0-4)

Glucose rising. Plain hyperglycemia.
Insufficient insulin -- may still have some.
High glucose alone is not DKA.

Middle (typically hours 4-10)

Ketones rising. Nausea, abdominal pain, headache begin. Only dangerous if truly insufficient insulin throughout.
Your body is signaling distress clearly.

Late (typically 10+ hours)

Severe vomiting, confusion. Medical emergency.

WHO GETS DKA

DKA is not random. It concentrates in specific groups for specific reasons.

At diagnosis

30-38%

of children present with DKA at T1D diagnosis

T1D often unrecognized until crisis. Symptoms often mimic childhood illness.

SEARCH Study, PMC 2021
StatPearls / NCBI 2023

Engaged families are a protective factor.

Teens & young adults

30%

of young women with T1D underuse insulin for weight control

Diabulimia is an eating disorder, not a diabetes failure. Requires mental health support.

Bryden et al., Diabetes Care, 1999 (longitudinal study)

20% of recurrent DKA in young T1Ds linked to eating disorders.

Adults managing long-term

1.3%

annual rate, well-controlled adults

Risk drops with engagement. When it happens: illness, pump failure, rationing, or omission. None random.

Diabetes Care
Annals Int. Medicine 2022

18.6% of T1D adults ration insulin due to cost.

Exception: euglycemic DKA (eDKA)

eDKA breaks the classical pattern -- glucose appears normal but ketones are dangerously elevated.

Risks: SGLT2 inhibitors, very low carb diets, surgery, prolonged fasting, pregnancy. Glucose alarms won't catch it.

EXERCISE

Proof that ketones aren't the enemy

Aerobic zones (1-2)

Ketones rise. Fat burning. Normal and healthy. Muscles use ketones as fuel.

Zone 3 (transition / threshold)

Mixed aerobic-anaerobic. Ketone production begins to level off as intensity rises.

Anaerobic zones (4-5)

Ketones drop. Body runs on glucose. Muscles draw glucose without insulin (NIMGU).
Higher ketones during aerobic work do not signal DKA risk -- glucose is usually low or falling.

DKA doesn't happen quickly or without warning.

Engagement is protection -- for adults managing their own care, and for parents navigating it alongside their kids.

Source: Heller, D. Type 1 Diabetes: It's Not That Simple -- Wolfsdorf, Glaser, and Sperling -- ISPAD Clinical Practice Consensus Guidelines

This graphic is for educational purposes only and does not constitute medical advice. Always consult your care team.