

Diabetes Ketoacidosis (DKA) Trick and pitfall



ต้องตรวจต่อม

Diabetes Ketoacidosis

- Acute metabolic complications of diabetes
- The triad of uncontrolled hyperglycemia, metabolic acidosis and increased total body ketone concentration

Pathogenesis

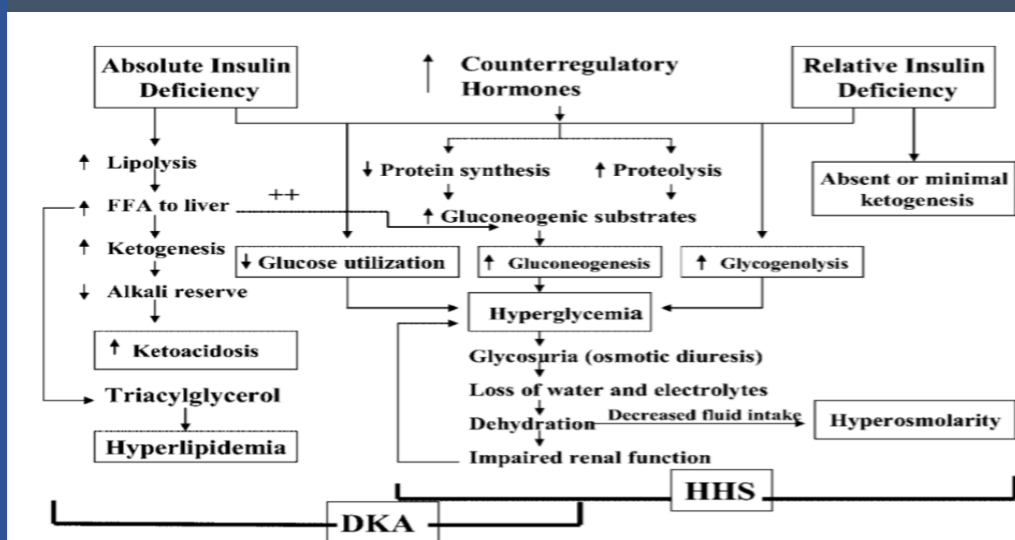


Figure 1—Pathogenesis of DKA and HHS: stress, infection, or insufficient insulin. FFA, free fatty acid.

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Precipitating factor (Five I's)

- Infection: UTI, pneumonia Leukocytosis > 25,000 mm³
- Ignorance: non-compliance
- Ischemia or infarction: MI, stroke
- Intoxication: alcohol
- Illness: acute pancreatitis

Presentation

Clinical

- Polyuria
- Polydipsia
- Weight loss
- Vomiting
- Weakness
- Mental status change

Physical examination

- Poor skin turgor
- Tachycardia
- Hypotension
- Kussmaul breathing
- Abdominal pain
- Neurological deficit

Diagnosis

- Blood glucose > 250 mg/dl
- Ketonuria or ketonemia (beta-hydroxyl butyrate > 3 mmol/L, ketonuria > 2+)
- Arterial pH <7.3 or serum HCO₃ <18 mEq/L

Euglycemic DKA (10%)

- Prolong fasting
- Pregnancy
- Partially treated with insulin
- Alcoholism
- Use SGLT2i

Severity

	DKA		
	Mild (plasma glucose >250 mg/dl)	Moderate (plasma glucose >250 mg/dl)	Severe (plasma glucose >250 mg/dl)
Arterial pH	7.25-7.30	7.00 to <7.24	<7.00
Serum bicarbonate (mEq/l)	15-18	10 to <15	<10
Urine ketone*	Positive	Positive	Positive
Serum ketone*	Positive	Positive	Positive
Effective serum osmolality†	Variable	Variable	Variable
Anion gap‡	>10	>12	>12
Mental status	Alert	Alert/drowsy	Stupor/coma

Principle of Management

- Intravenous fluid
- Electrolyte
- Insulin
- Identify and precipitating causes
- Prevention of recurrence

IV fluid management

- First hours: 0.9% NaCl 1,000-1,500 ml/hr (slower if cardiac, renal compromise)

	Low corrected Na	Normal/high corrected Na
Fluid	0.9% NaCl	0.45% NaCl
	Change to 5-10% Dextrose when CBG 200-250 mg/dL	
Rate	250-500 ml/hr	250-500 ml/hr

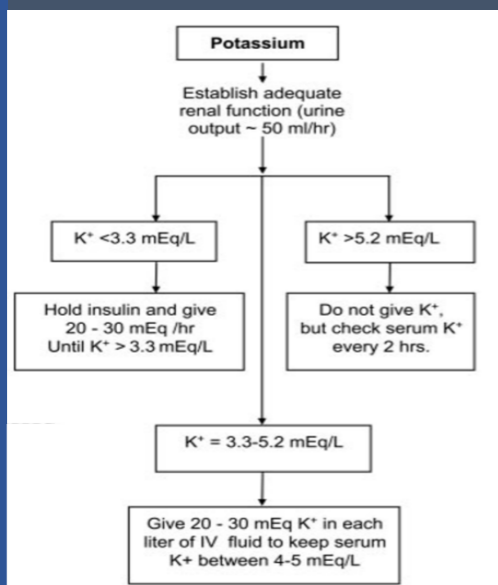
IV fluid management

- Two bag method

0.45% or 0.9% NaCl without dextrose +KCL 10-20 meq

0.45% or 0.9% NaCl with 10% dextrose +KCL 10-20 meq (glucose 4-6 g/hr)

Electrolyte management

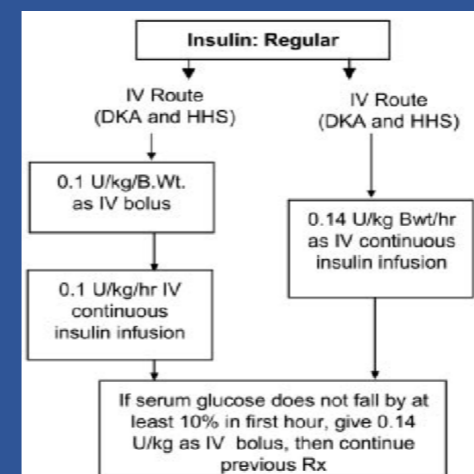


NaHCO₃ in DKA

- pH > 6.9, no NaHCO₃
- pH < 6.9, give NaHCO₃ 100 mmol (2amp) in water +KCL 20 mEq in 2 hr

Insulin management

- Insulin should not be started until after initiation of fluid resuscitation and correction of hypokalemia



Target: decrease 50-75 mg/dL/hr

When serum glucose reaches 200 mg/dl, reduce regular insulin infusion to 0.02 - 0.05 U/kg/hr IV, or give rapid-acting insulin at 0.1 U/kg SC every 2 hrs. Keep serum glucose between 150 and 200 mg/dl until resolution of DKA.

Monitoring

- Record V/S, I/O, mental status
- Measure CBG q 1-2 hr
- Electrolyte, +/- venous pH q 2-4 hr

Resolution of DKA

Plasma glucose < 200 mg/dL and two of the following criteria

- Venous pH >7.3
- $\text{HCO}_3^- \geq 15$ mmol/L
- Anion gap ≤ 12

Transition period

- When? : tolerate oral intake
- How?: start sc insulin at least 1-2 hr before IV insulin stop

Insulin regimen and dose

- Basal bolus regimen
- Insulin naïve: 0.5-0.8 unit/kg/day
- Previous insulin: start from previous dose

Prevention of recurrent DKA

- Sick day management
- Self monitoring: glucose, ketone
- Adequate insulin supply
- Health care accessibility

Common pitfall

- Precipitating cause: **T2DM**
- CBG not decrease to target: **inadequate volume replacement**
- Insulin preparation: **forget priming**
- K replacement: adequate renal function (urine > 50ml/hr)