

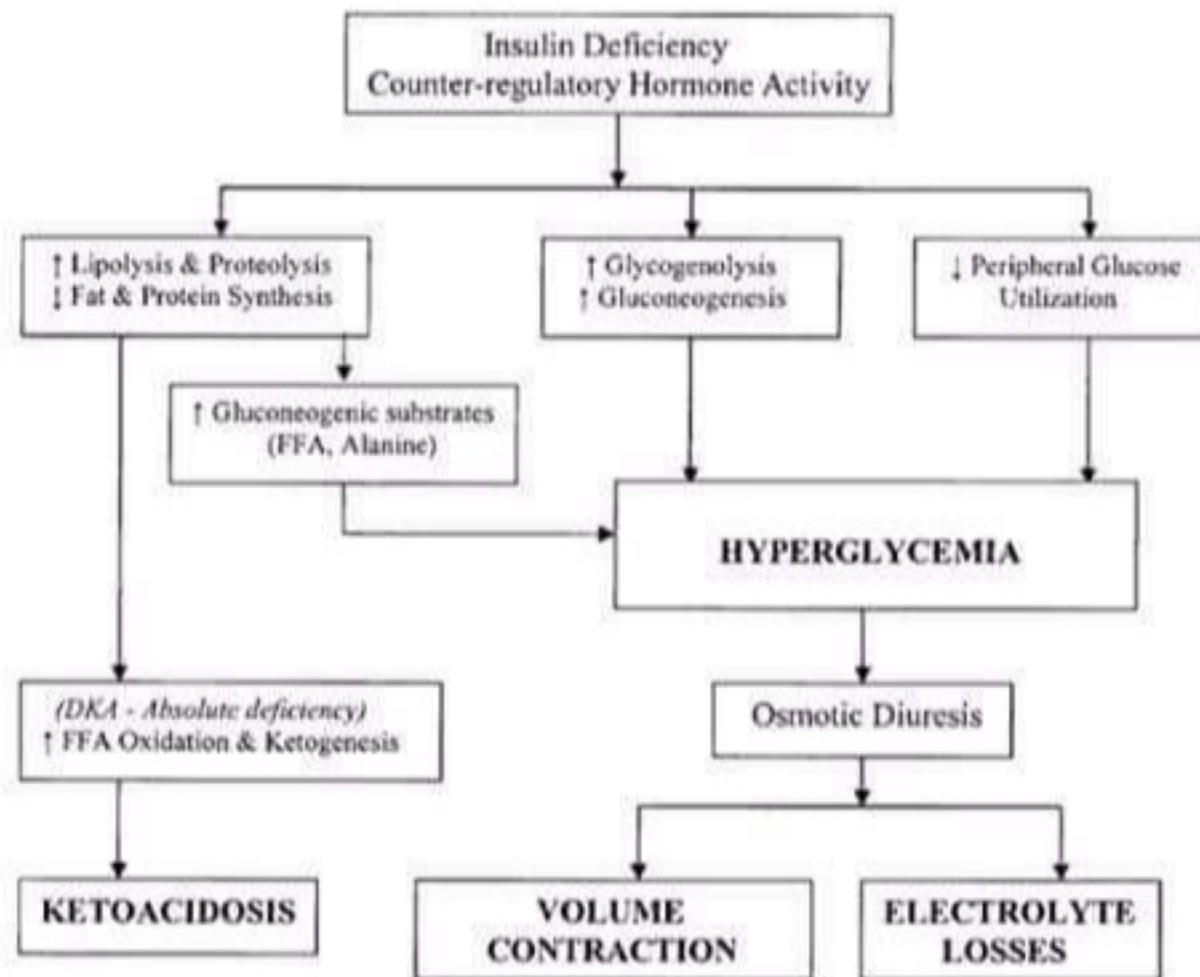
DIABETIC EMERGENCIES

Fb/Nurse Info

Introduction.

- Diabetic hyperglycaemic crises are common.
- In the West, DKA occurs with an annual incidence of 4-8 episodes per 1000 diabetic patients.
- Incidence of HHS lower than that of DKA.
- With increasing prevalence of DM, increase in number of DKA, and HHS is expected.
- Could be the presenting feature in previously undiagnosed diabetics.
- There is usually a precipitating factor.

Pathogenesis of Diabetic Hyperglycaemic states.



Diagnosis.

- Symptoms

Vomiting, abdominal pain, shortness of breath and symptoms of precipitating condition

- Signs

Dehydration, tachycardia and hypotension
hyperventilation (Kussmaul respiration), ketones on breath, drowsiness / coma.

DIAGNOSIS

- Biochemical criteria

Blood glucose (>11.1 mmol/L) [or known diabetes]

Ketonuria ++ or more

Serum bicarbonate <15 mmol/L

PH <7.3 .

Indicators of severe DKA:

- Venous bicarbonate $<10\text{mmol/l}$
- $\text{pH} < 7.0$ (if measured)
- Hyperventilation
- Hypotension (systolic BP <90)
- Depressed conscious level (document GCS)

Blood glucose is not a good guide to severity

Diagnosis of HONK

Typical features include:

- severe hyperglycaemia (> 50 mmol/l)
- hyperosmolarity (> 320 mosmol/kg) with profound dehydration and prerenal uraemia
- depression of the level of consciousness; coma is well recognised

Plasma osmolality

$2 \times (\text{Na} + \text{K}) + \text{urea} + \text{glucose}$ (all mmol/l)
Normal range is 280 – 300 mosmol/kg

Laboratory diagnosis and classification of DKA and HHS

	Mild DKA	Moderate DKA	Severe DKA	HHS
Plasma glucose (mg/dL)	>250	>250	>250	>600
Serum osm (mosm/kg)	Variable	Variable	Variable	>320
Urine/serum ketones	Positive	Positive	Positive	Weak/negative
Arterial pH	7.25–7.30	7.00–7.24	<7.00	>7.30
Serum HCO_3^- (mEq/L)	15–18	10–15	<10	>15
Anion gap (mEq/L)	>10	>12	>12	<12

MANAGEMENT.

START TREATMENT IMMEDIATELY – DELAY MAY BE FATAL

- Obtain good intravenous access – if peripheral access is difficult insert central line
- Commence intravenous saline and insulin immediately (see fluid / insulin guidelines)
- Consider ITU/HDU if patient confused / unconscious, hypotensive (systolic BP < 90) or bicarbonate <10mmol/l
- Essential investigations:
 - lab blood glucose
 - urea and electrolytes
 - venous bicarbonate (can be measured on blood gas analyser)
 - ECG
 - CXR / MSU / blood cultures / FBC

- Other measures
 - Strict fluid balance – urinary catheter if incontinent or if no urinary output after 2 hours
 - Consider CVP line if patient elderly or has evidence of poor LV function
 - Insert nasogastric tube if conscious level impaired (protect airway)
 - Consider thromboprophylaxis if severe dehydration or elderly
 - Antibiotics if evidence of infection (see 'catches for the unwary' below)

MANAGEMENT.

IV Fluids	<ul style="list-style-type: none">• give 1L 0.9% sodium chloride solution over the first hour• if BP <90 systolic consider a plasma expander• rate of fluids thereafter depends on age / fitness of patient, typically<ul style="list-style-type: none">- 1L in next hour- 2L in next 2-4 hours- then 1L 4-6 hourly• reduce rate in elderly/cardiac disease/mild DKA ($\text{HCO}_3^- > 10$)• more rapid infusion increases risk of respiratory distress syndrome• switch to 5% glucose 1L 8 hourly once BG ≤ 15 mmol/L; continue 0.9% saline concomitantly if still volume deplete
Insulin	<ul style="list-style-type: none">• dilute 50 units of soluble insulin to 50 ml 0.9% saline in a syringe (ensure the drawing up is witnessed and signed for)• infuse intravenously, using syringe driver, starting at 6 units/hour. Give 10 units soluble insulin intramuscularly if delay in starting IV anticipated• check venous glucose at 2 hours; if glucose has not fallen check pump working and IV connections, then increase to 10 u/hour• measure capillary BG hourly• once glucose falling, adjust insulin infusion rate according to Insulin infusion schedule

USE OF BICARBONATE IN DKA (HDU/ITU)

Potential harmful effects

- Possible hypokalaemia and arrhythmia
- Exacerbation of intracellular and intracerebral acidosis due to CO_2 crossing cell membranes and blood brain barrier, when HCO_3^- cannot
- Possible increased risk of cerebral oedema

Potential benefits

- Reduced cardiac irritability
- Reduced respiratory discomfort
- Reduction in iv chloride load and avoidance of hyperchloraemic acidosis

COMPLICATIONS.

- **Hypoglycaemia and hypokalaemia**
Monitor carefully to anticipate and prevent
- **Aspiration**
Ensure nasogastric tube and airway protection in unconscious patient
- **Underlying conditions**
Ensure these are identified and treated appropriately
- **Cerebral oedema**
This condition is uncommon but may occur, particularly in young adults

Symptoms / signs

- headache
- bradycardia and rising BP
- change in neurological status (decreased conscious level, restlessness, irritability)
- focal neurological signs
- convulsions
- papilloedema

Management

- exclude hypoglycaemia
- discuss with consultant and transfer to ITU
- give mannitol 20% 5ml/kg over 20 minutes
- obtain CT scan of head to exclude other causes