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**DIABETIC KETOACIDOSIS**

# **DIABETIC KETOACIDOSIS**

## **1. Diabetic ketoacidosis**

- A) Define
- B) Enlist the aetiology, pathophysiology, clinical manifestation, diagnostic evaluation.
- C) Explain the management

## **INTRODUCTION**

Diabetic ketoacidosis is most common in people with type 1 diabetes, but may also occur in those with type 2 diabetes. Diabetic ketoacidosis (DKA) is a state of inadequate insulin levels resulting in high blood sugar and accumulation of organic acids and ketones in the blood. It is also common in DKA to have severe dehydration and significant alterations of the body's blood chemistry

### **a) DEFINITION DIABETIC KETOACIDOSIS**

DKA is caused by an absence or markedly inadequate amount of insulin. This deficit in available insulin results in disorders in the metabolism of carbohydrate, protein, and fat.

The three main clinical features of DKA are:

- Hyperglycemia
- Dehydration and electrolyte loss
- Acidosis

## **EPIDEMIOLOGY**

- DKA accounts for 14% of all hospital admissions of patients with diabetes.
- Almost 50% of diabetes-related admissions in young persons are related to DKA
- it is estimated to be 1 out of 2000.
- The incidence is roughly episodes per 100 patient years of diabetes

### **b) Enlist the aetiology, pathophysiology, clinical manifestation, diagnostic evaluation**

## **ETIOLOGY**

The most common scenarios for diabetic ketoacidosis (DKA)

- Infection (40%),
- Missed insulin treatments (25%) and
- Newly diagnosed, previously unknown diabetes (15%).
- Other associated causes make up roughly 20% in the various scenarios

Causes of DKA in type 1 diabetes mellitus include the following:

- Poor compliance with insulin
- Bacterial infection and intercurrent illness (*Klebsiellapneumoniae*)
- Medical, surgical, or emotional stress
- Idiopathic (no identifiable cause)

Mechanical failure of the insulin infusion pump

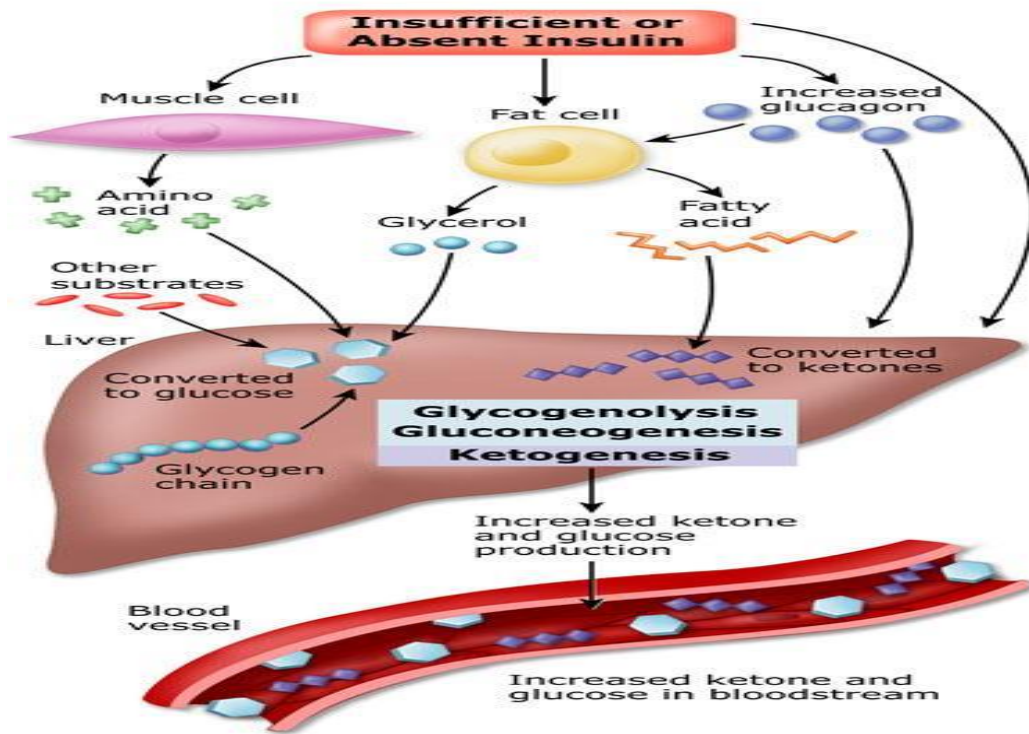
Causes of DKA in type 2 diabetes mellitus include the following

- Intercurrent illness (eg, myocardial infarction, pneumonia, prostatitis, UTI)
- Medication (eg, corticosteroids, pentamidine, clozapine)

DKA also occurs in pregnant women, either with preexisting diabetes or with diabetes diagnosed during pregnancy

## **PATHOPHYSIOLOGY**

## Diabetic Ketoacidosis



# ***Signs and Symptoms of DKA***

- Polyuria, polydipsia
  - Enuresis
- Dehydration
  - Tachycardia
  - Orthostasis
- Abdominal pain
  - Nausea
  - Vomiting
- Fruity breath
  - Acetone
- Kussmaul breathing
- Mental status changes
  - Combative
  - Drunk
  - Coma



## **Early**

- Polydipsia, polyuria
- Fatigue, malaise, drowsiness
- Anorexia, nausea, vomiting
- Abdominal pain, muscle cramps

## **Later**

- Kussmaul's respirations (deep respirations)
- Fruity, sweet breath
- Hypotension, weak pulse
- Stupor and coma

# Diagnosis

**Table -1 Diagnostic criteria for diabetic ketoacidosis and the hyperosmolar hyperglycemic state**

	Mild DKA	Moderate DKA	Severe DKA
Plasma glucose (mg/dL)	>250	>250	>250
Effective serum osmolality (mOsm/kg)	Variable	Variable	Variable
Urine or serum ketones (NP reaction)	Positive	Positive	Positive
Arterial pH	7.25–7.30	7.00–7.24	<7.00
Serum bicarbonate (mEq/L)	15–18	10–15	<10
Anion gap (mEq/L)	>10	>12	>12
Typical mental status	Alert	Drowsy	Stupor or coma

## Investigations

- Glucose level.
- Serum Ketones.
- Acid-base status: pH, Serum bicarbonate and Anion gap.
- Electrolytes:  $\text{Na}^+$   $\text{K}^+$   $\text{Cl}^-$   $\text{Mg}^{+2}$
- ECG
- CBC, WBC.
- Urinalysis.
- Cardiac markers, Liver enzymes and Amylase.
- Chest X-Ray.
- Blood and urine culture.

c) Explain medical management

**MEDICAL MANAGEMENT**

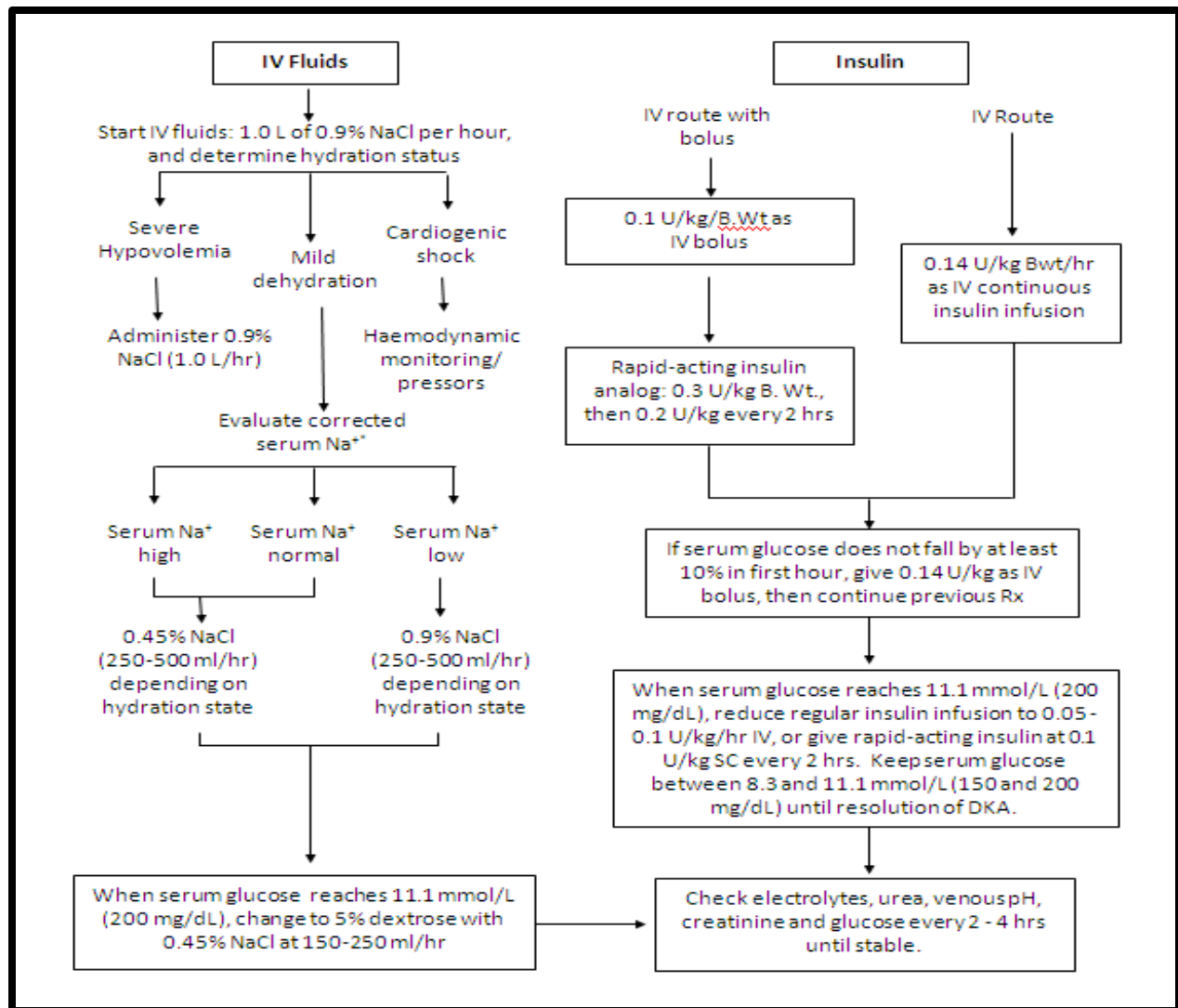
**Immediate management – Within the First Hour**

*Initial Assessment*

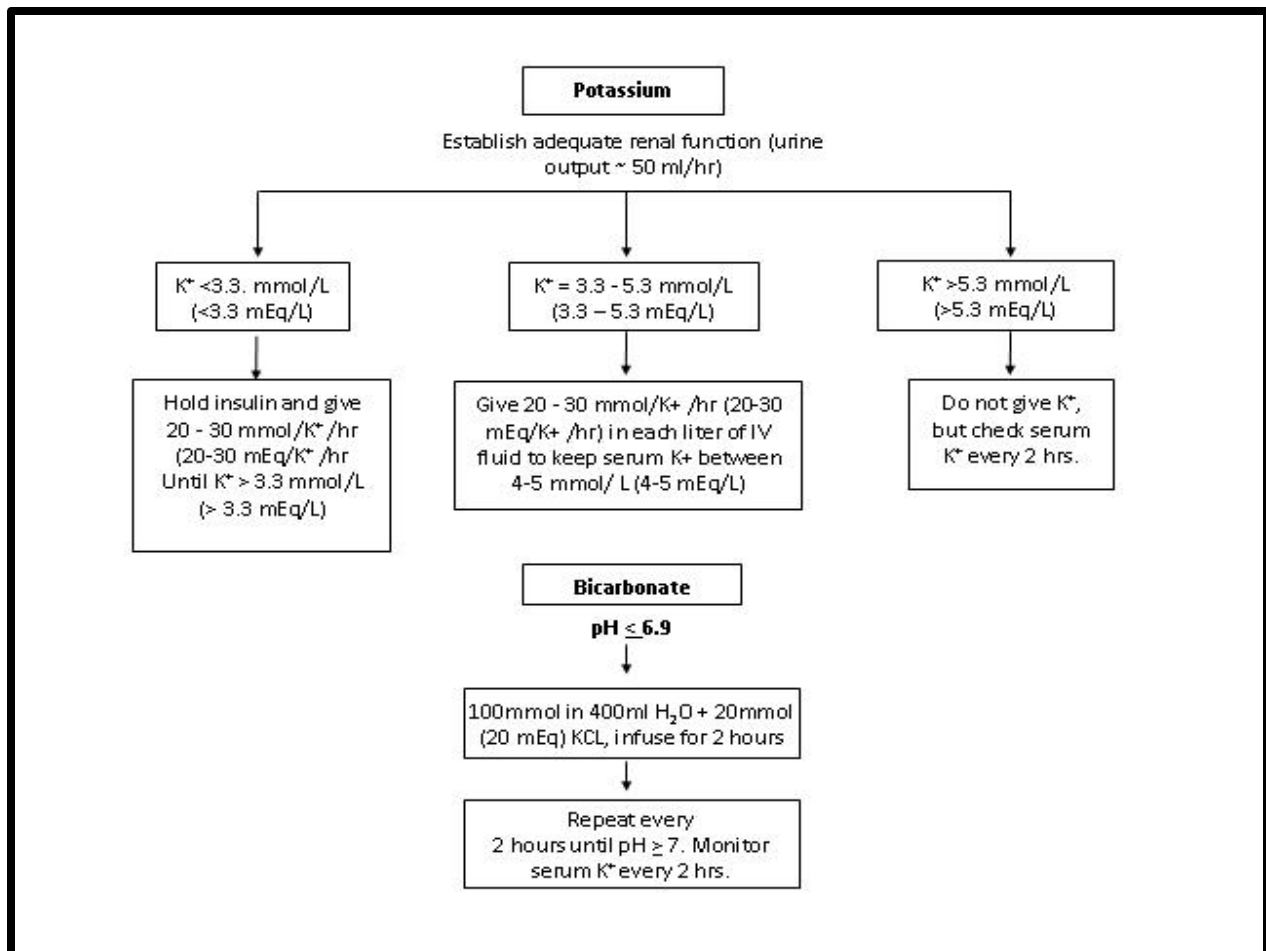
- Airway and breathing - correct hypoxemia.
- IV access.
- Monitor ECG, O<sub>2</sub> saturations, pulse, BP, respiratory rate, conscious level and fluid balance.
- Laboratory blood glucose, bedside BM, urea and electrolytes, serum bicarbonate,
- arterial blood gases.

## Management cont.

- **Administer short acting insulin:** IV (0.1 units/kg) or IM (0.3 units/kg), then 0.1 units/kg/hour by continuous IV infusion; increase 2- to 3-fold if no response by 2–4 h. If initial serum  $K^+$  is  $< 3.3 \text{ mmol/L}$ , do not administer insulin until the potassium is corrected to  $> 3.3 \text{ mmol/L}$ .
- **Assess patient:** What precipitated the episode (noncompliance, infection, trauma, infarction, cocaine)? Initiate appropriate workup for precipitating event (cultures, CXR, ECG).
- **Measure capillary glucose every 1–2 h;** measure electrolytes (especially  $K^+$ , bicarbonate, phosphate) and anion gap every 4 h for first 24 h.







### Other Interventions/Actions

- NG tube if impaired consciousness or protracted vomiting.
- Urinary catheter: if cardiac failure, persistent hypotension, renal failure or no urine passed after 2 hours.
- **CVP line:** consider if elderly with concomitant illness, cardiac failure or renal failure.
- Give standard venous thromboembolism prophylaxis.
- **Antibiotics:** only if infection is proven or strongly suspected. Remember that raised WBC and fever occur with metabolic acidosis.
- Screen for myocardial infarction if > 40 years old
- Admits patient to a high dependency area.

### **Nursing Diagnoses**

- Deficient Fluid Volume related to hyperglycemia
- Ineffective Therapeutic Regimen Management related to failure to increase insulin during illness

### **Patient Education and Health Maintenance**

- Teach patients how to avoid DKA by self-testing for urinary ketones when their blood glucose is high or when they have unexplained nausea or vomiting and adjusting their insulin regimens on sick days.
- It is essential to educate patients in the prevention of diabetic ketoacidosis (DKA) so that a recurrent episode can be avoided.
- The patient education program needs to ensure that patients understand the importance of close and careful monitoring of blood glucose levels, particularly during infection, trauma, and other periods of stress.

### **Complication**

- Cerebral edema
- Cardiac dysrhythmia
- Pulmonary edema
- Nonspecific myocardial injury may occur in severe DKA.
- Microvascular changes consistent with diabetic retinopathy

### **Prognosis**

- **Excellent:** especially in younger patients if intercurrent infection are absent
- The worst prognosis: is usually observed in patient who are older with severe intercurrent illnesses, eg; myocardial infarction, sepsis, or pneumonia, especially when they are treated outside an ICU.
- Sign of poor prognosis: deep coma at the time of diagnosis, hypothermia and oliguria.

### **BIBLIOGRAPHY**

- Brunner and suddarth's text book of medical surgical nursing 11th edition published by lippincott- williams new Delhi pg.no 1994-1999
- Lewis Hert Hemper, Dirtsen O Brien Bucher, Medical and Surgical nursing Edition 7 Page No.1589 to 1609.
- Ross and wilson anatomy and physiology 10th edition published by elsevier pg.no 357 - 360
- Joyce M Black, Jam Hankerson Hawks Medical surgical nursing Edition 7, Page no.2211 to 2234.

- Sole, Klein, Moseley, (2005), Introduction to critical care nursing, 4<sup>th</sup> edition, St Louis; Elsevier publication Pp:334-336
- Linda, s. Williams, Paula , D. Hopper, Understanding medical surgical nursing, 3<sup>rd</sup> edition, New Delhi; Jaypee publication Pp:527-528