

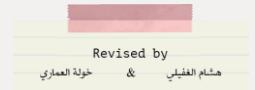


# Management of diabetic ketoacidosis

Done by:

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The most imp. slides are 4<sup>th</sup> & first half of 6<sup>th</sup> slides

Drug's name | Doctors' notes | Important | Extra

« لو أن الناس كلما استصعبوا أمرًا تركوه؛ ما قام للناس دنيا ولا دين! »

# Mind Map

In **absence** of insulin  
some metabolic changes can occur

## Carbohydrates

↑ **Glycogenolysis**  
↑ **Gluconeogenesis**

## Protein

↑ **Proteolysis**  
(↑ protein catabolism) →  
**providing amino acid as precursors for gluconeogenesis.**

## Fats

↑ **Lipolysis**  
↑ **Ketogenesis**  
Fat breakdown to free fatty acids then to acetyl-CoA that is converted to ketone bodies (Acetoacetic acid,  $\beta$ -OHB, Acetone)  
الكيتوز يتطوّر نتيجة زيادة في الدهون، أكثر أرق بين hypo or hyperglycemic coma

↑ **Hyperglycemia**

**Glucosuria<sup>1</sup>**

**Osmotic diuresis<sup>2</sup>**

**Dehydration & electrolyte imbalance<sup>3</sup>**

↑ **Lipolysis** → ↑ **FFA**

↑ **Keton bodies**

**Ketonemia**

**Ketonurea & Acidosis**

<sup>1</sup> G exceed the reabsorption threshold in the nephron → that's why it appears in the urine.

<sup>2</sup> G has osmotic effect (withdraw water) → polyuria appears → may result in dehydration.

<sup>3</sup> Fluid loss induces dehydration & electrolyte imbalance

## Lines of treatment of diabetic ketoacidosis

Dehydration  
(**fluid therapy**)

Hyperglycemia  
(**insulin**)

Electrolyte deficit  
(**potassium therapy**)

Ketoacidosis  
(**bicarbonate therapy**)

# To Understand Better | Diabetic ketoacidosis

## Definition

- Is a **serious acute emergency situation** that requires admission to hospital with a risk of death.
- It develops as a result of **insulin deficiency**.
- It is a characteristic feature of **type I diabetes** but may occur with **type II especially during stress**.

## Characters

- **Hyperglycemia**
- Polyuria
- Ketogenesis (ketonemia, ketonuria)
- **Metabolic acidosis (induces hyperventilation)**
- Polydipsia (increased drinking).
- Glucosuria
- Electrolyte imbalance
- Dehydration
- Osmotic diuresis
- Thirst

## Clinical symptoms

- Classic features of hyperglycemia (**thirst, polyuria**)
- Nausea, vomiting, **abdominal pain**
- **Tachycardia**
- **Kussmaul–Kien respiration** (rapid & deep).
- **Ketotic breath (fruity, with acetone smell)** clue for diabetic ketoacidosis coma
- Mental status changes (**confusion, coma**)

## Diagnostic criteria

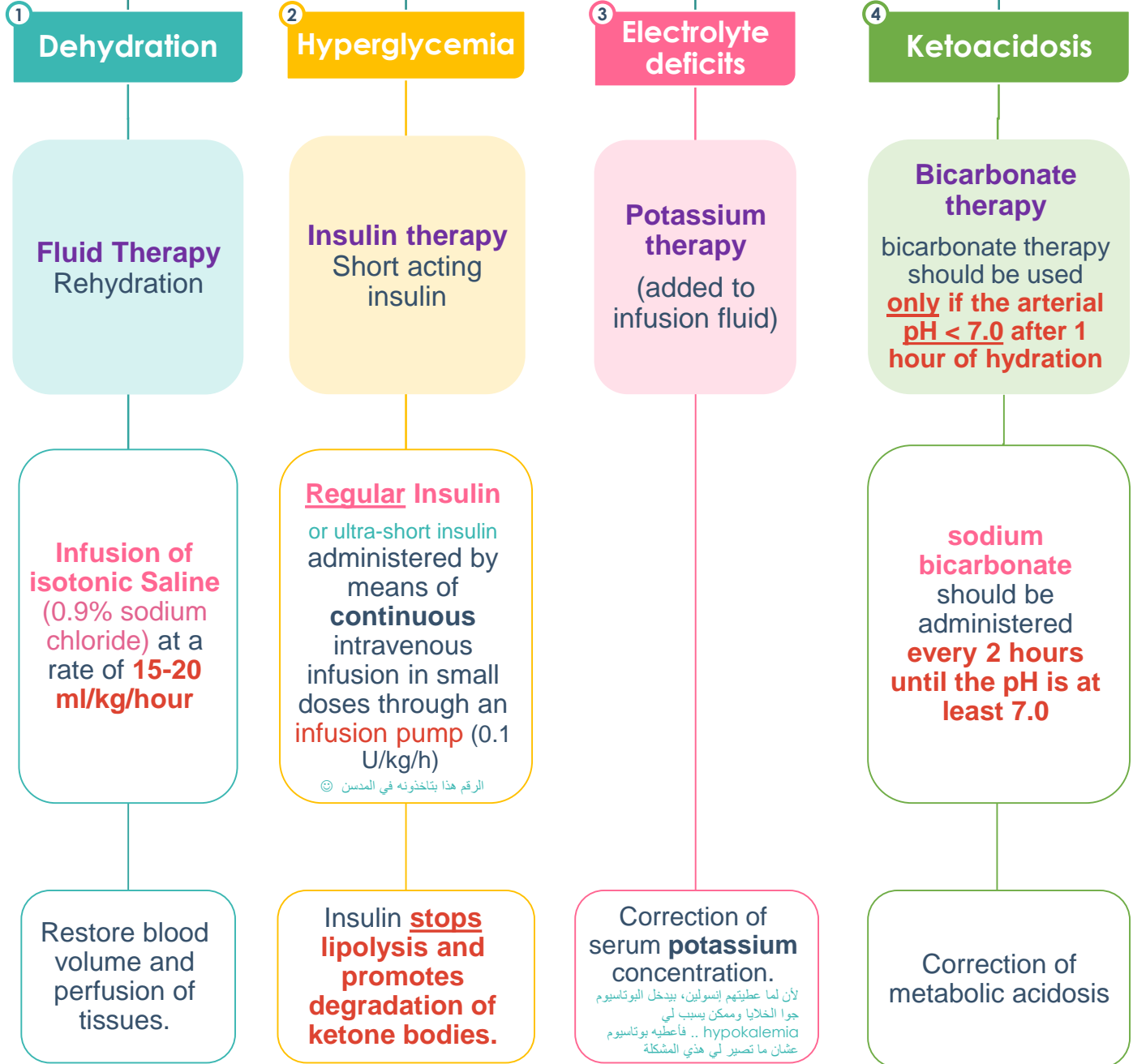
- Blood glucose level > 250 mg/dl
- Arterial pH < 7.35
- Serum bicarbonate level < 15 mmol/L
- Ketonemia
- Ketonuria



# Treatment of ketoacidosis

## Lines of treatment of diabetic ketoacidosis

أبدأ العلاج حسب الأهمية بالترتيب (نفس الأرقام)



### Biochemistry:

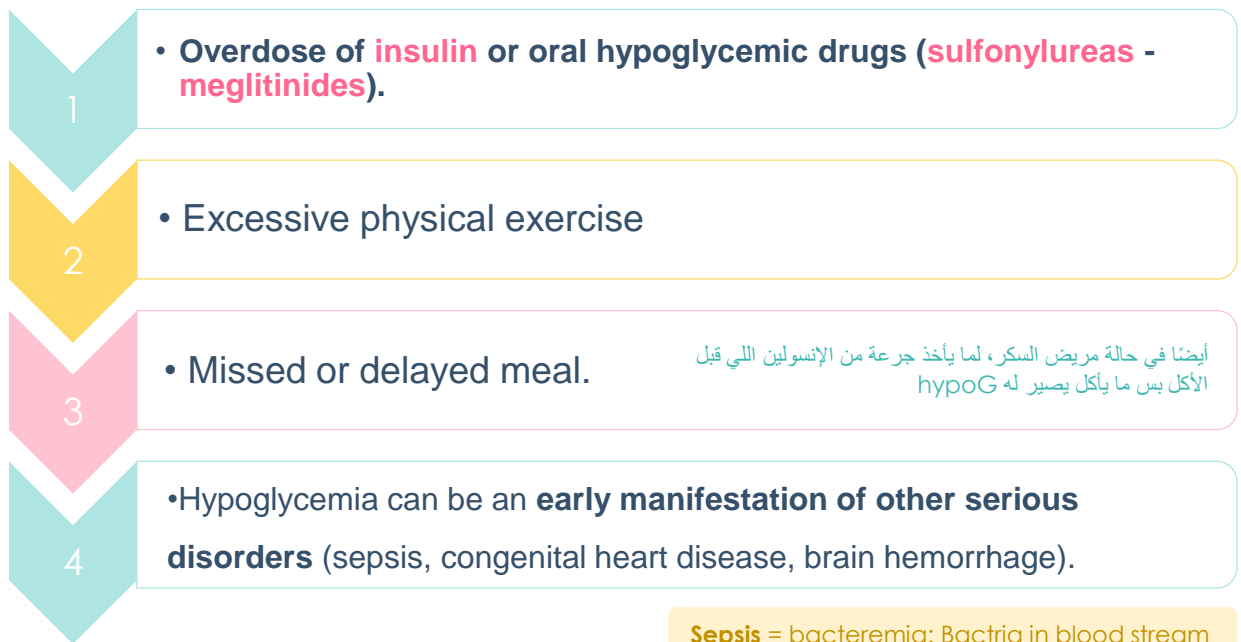
Ketone bodies? They are products of **Liver mitochondria's** conversion of **acetyl CoA** derived from fatty acid oxidation. And there are **3** of them: **1) Acetoacetate, 2) 3-Hydroxybutyrate, 3) Acetone.**

# To Understand Better | Hypoglycemia

## Definition:

- A condition where Blood sugar is less than **70 mg/dl** is considered to be **hypoglycemia**.
- IF the sugar (glucose) levels reach to less than **50 mg/dl** then it becomes a **life threatening disorder**.
- **One of the common side effects of insulin in treating type I diabetes.**

## Causes:



## Characters:

### Autonomic

#### Sympathetic:

- Tachycardia, palpitation, sweating, anxiety, tremor.

If diabetic pt take **beta-blockers**, there is a risk of developing hypoglycemia (asymptomatic bc we block beta receptors → no feeling of palpitation, ...)

#### Parasympathetic:

- Nausea, vomiting.

### Neurological defects

1. Headache, visual disturbance, slurred speech, dizziness.
2. Tremors, mental confusion, convulsions.
3. Coma due to low blood glucose to the brain



# Treatment & Management of Hypoglycemia

## Precautions:

Hypoglycemia can be prevented by:

### Monitoring of blood glucose level

(blood sugar level should be checked routinely)

Patients should carry **glucose tablets or hard candy** to eat if blood sugar gets too low

Diabetic patient should **wear a medical ID bracelet or carry a card.**

Patient should **not skip meals or eat partial meals.**

Patients should eat extra carbohydrates if they will be more active than usual.

## Treatment:

I have 2 choices depending on patient's state, If he is:

**conscious**

**Sugar containing beverage or food (30g orally).**

**unconscious**

**A- Glucagon (1 mg S.C. or I.M.)** (Better, bc it is administered by non-medical personnel)

**B- 20-50 ml of 50% glucose solution I.V. infusion**  
(**risk of possible phlebitis -inflammation of veins-**).

لما تجيني كوما وأنا ما أقدر أفرق إذا هيا hypo OR hyperglycemic coma أعالجها على أي أساس؟ أعالجها على أساس إنها HYPO لأن الخطر أكثر (مافيه G توصل للدماغ!) ، أما الهايپر فهو أصلاً هايپر فلما أعطيه سكر زيادة مراح يتأثر كثير..

## Hypo & Hyperglycemic coma (not imp. in pharma part)

Coma type	<b>Hypoglycemia</b> <b>High insulin</b>	<b>Hyperglycemic Diabetic ketoacidosis</b> <b>Low insulin</b>
Onset	Rapid	Slow (over days)
Acidosis & dehydration	No	Ketoacidosis
B.P.	Normal	Subnormal or in shock
Respiration	Normal or shallow	Air hunger
Skin	Pale & sweating	Hot & dry
CNS	Tremors, mental confusion, convulsions	General depression
Blood sugar	Lower than 70mg\100cc	More than 200mg\100cc
Ketones	Normal	Elevated

# Summary

## Treatment of diabetic ketoacidosis

<b>First correction of dehydration</b>	<ul style="list-style-type: none"> <li>○ <b>Fluid therapy</b> :Infusion of isotonic saline (0.9% sodium chloride) to Restore blood volume and perfusion of tissues.</li> </ul>
<b>2ed correction of hyperglycaemia</b>	<ul style="list-style-type: none"> <li>○ <b>Regular insulin (short acting)</b> :should be administered by means of continuous intravenous infusion in small doses through an infusion pump it stops lipolysis and promotes degradation of ketone bodies .</li> </ul>
<b>3ed correction of Electrolyte deficits</b>	<ul style="list-style-type: none"> <li>○ <b>Potassium therapy</b> : potassium is added to infusion fluid to correct the serum potassium concentration.</li> </ul>
<b>4th correction of Ketoacidosis</b>	<ul style="list-style-type: none"> <li>○ <b>Bicarbonate therapy</b> : for metabolic acidosis should be used only if the arterial pH &lt; 7.0 after 1 hour of hydration.</li> <li>○ (should be administered every 2 hours until the pH is at least 7.0)</li> </ul>

## Treatment of Hypoglycaemia

<b>Conscious patient</b>	<b>Unconscious patient</b>
<ul style="list-style-type: none"> <li>○ <b>Sugar containing beverage or food (30 g orally)</b></li> </ul>	<ul style="list-style-type: none"> <li>○ <b>Glucagon (1 mg S.C. or I.M )</b></li> <li>○ <b>20-50 ml of 50% glucose solution I.V. infusion( risk of possible phlebitis )</b></li> </ul>

# MCQs

**1- Which one of the following is NOT a treatment in a case of diabetic ketoacidosis:**

- A- Infusion of isotonic Saline at 15-20 ml/kg/hour
- B- Sodium bicarbonate every 2 hours until the pH is at least 7.0.
- C- Glucagon (1 mg S.C. or I.M.)
- D- Insulin through an infusion pump (0.1 U/kg/h).

**2- In Hyperglycemic coma, which one of the following is correct:**

- A- Skin is hot and dry
- B- Normal or shallow respiration
- C- Rapid onset
- D- Skin is sweaty and pale

**3- the reason for giving potassium therapy is to correct which of the following:**

- A- Ketoacidosis
- B- Electrolyte deficit
- C- Hyperglycemia
- D- Dehydration

**4- Diabetic ketoacidosis is mainly a characteristic feature of:**

- A- type I diabetes
- B- type II diabetes
- C- both type I and II

**5- The insulin preparation of choice in diabetic ketoacidosis is:**

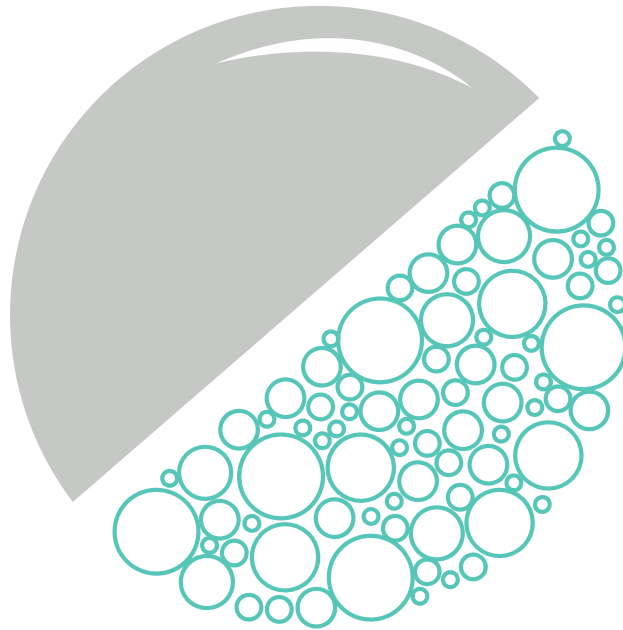
- A- Regular insulin
- B- Lente insulin
- C- Isophane insulin
- D- A 30:70 mixture of plain and isophane insulin



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**Thank you for checking our team!**

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Pharmacology 435

 @ pharmacology435

**Sources:**

1. 435's slides.