

Management of diabetic ketoacidosis and hypoglycemia

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- Main text
- Male slide
- Female slide
- Important
- Dr, notes
- Extra info

EDITING FILE

Objectives



Identify the different characters of diabetic ketoacidosis.



Know the different lines of treatment for hyperglycemia, dehydration, electrolyte deficits and ketoacidosis.



Recognize the characters of hypoglycemia and how it can be prevented, Describe the different treatment of hypoglycemia



Be able to differentiate between hypoglycemia and hyperglycemia coma.

Complications of diabetes

Chronic

Macrovascular

Microvascular

Acute

Hypoglycemia

Diabetic coma

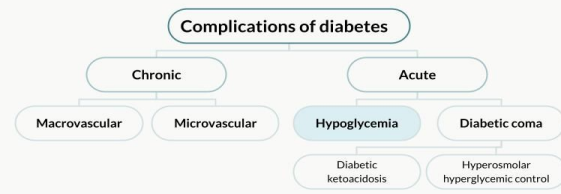
Diabetic
ketoacidosis

Hyperosmolar
hyperglycemic control



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Hypoglycemia



- Blood sugar of less than 70 mg/dl is considered hypoglycemia.
- Is a life threatening disorder that occurs when blood glucose level becomes < 50 mg/dl
- **Hypoglycemic reactions** are the most common complication of insulin therapy.

Causes

- Taking oral agents that stimulate insulin secretion.
- Particularly in elderly patients or in renal or liver disease,
- Taking certain other medications that alter metabolism of the **sulfonylureas** (e.g, **sulfonamides** warfarin).
- Excessive physical exercise, Missed or delayed meal

Symptoms

Autonomic features

- ↑ **Sympathetic**: tachycardia, palpitation, sweating, anxiety, tremor.
- ↑ **Parasympathetic**: nausea, **vomiting**, **hunger**.

Neurological defects

- Convulsions and coma if untreated
- Confusion, weakness, bizarre behavior, coma.

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.
- Patient should eat extra carbohydrates if he will be active than usual

Treatment

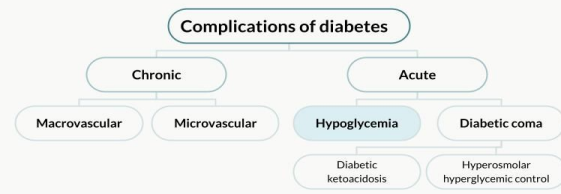
mild hypoglycemia (conscious and able to swallow)

1. dextrose tablets,
2. glucose gel
3. or any sugar-containing beverage or food may be given.

severe hypoglycemia (unconsciousness or stupor)

1. 1 mg of **glucagon** injected either SC or IM. This may restore consciousness within 15 minutes to permit ingestion of sugar.
2. In emergency 20–50 mL of 50% glucose solution by IV bolus over a period of 2–3 min

Hypoglycemia



Male slide

Other treatments

Somatostatin (SST)

- is produced by δ cells of the pancreatic islet, by cells of the GI tract, and in the CNS.
- SST acts through a family of five GPCRs.
- SST inhibits a wide variety of endocrine and exocrine secretions, including insulin.
- Longer-acting analogues such as **octreotide** and **lanreotide** are also useful for treatment of severe secretory diarrhea and carcinoid tumors. Given IM

Side effects

- Gallbladder abnormalities (stones and biliary sludge)

Diazoxide

- Is an antihypertensive, antidiuretic with potent hyperglycemic actions when given orally.
- Diazoxide interacts with the KATP channel on the β cell membrane and either prevents its closing or prolongs the open time. Thus, inhibits insulin secretion

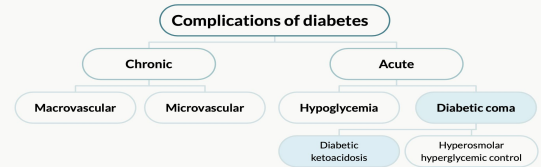
Adverse effects

- Retention of Na^+ and fluid, hyperuricemia, thrombocytopenia, and leukopenia

Uses

- may be useful in children with neonatal hyperinsulinism.

Diabetic Ketoacidosis (DKA)

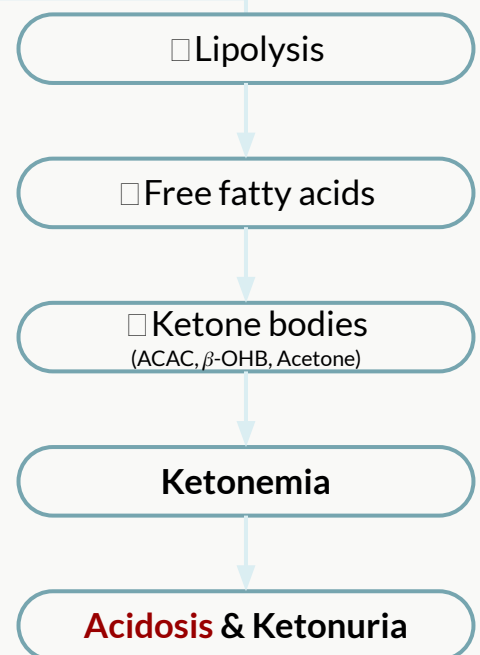
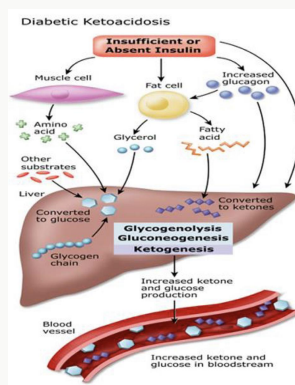
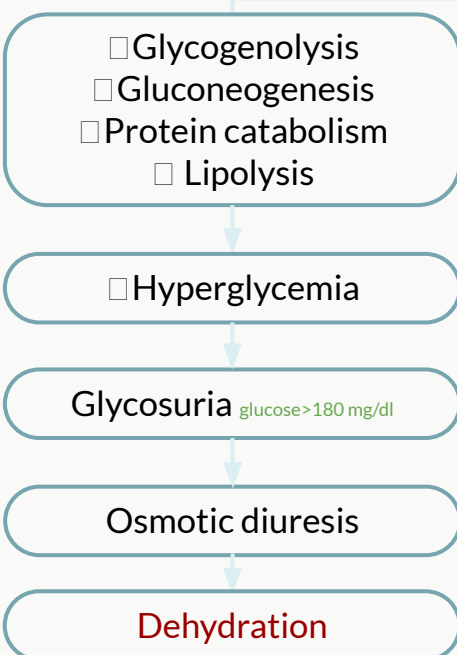


It is a life-threatening medical emergency caused by inadequate or absent insulin replacement

It typically occurs in newly diagnosed type 1 patients

Rarely in people with type 2 diabetes in stressful conditions such as sepsis or pancreatitis or are on high dose steroid therapy.

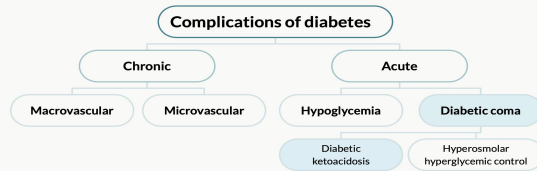
Insulin deficiency leads to:



- **Hyperglycemia** induces glycosuria, osmotic diuresis & severe fluid loss.
- Fluid loss induces **dehydration & electrolyte imbalance**.
- Metabolic **acidosis** induce hyperventilation



Diabetic Ketoacidosis (DKA)



Characteristics

1. Classic features of hyperglycemia (thirst, polyuria)
2. Ketotic breath (**fruity, with acetone smell**).
3. Kussmaul-Kien respiration (rapid & deep).
4. Tachycardia
5. Nausea, vomiting, abdominal pain
6. Mental status changes (confusion, coma)

Diagnostic criteria

- Blood glucose level > 250 mg/dl (ref. <100 mg/dl).
- Arterial pH < 7.35 (ref. 7.4).
- Serum bicarbonate level < 15 mmol/L (ref. 22-29).
- Ketonemia, Ketonuria.

Treatment of diabetic ketoacidosis

Adequate correction of:

1. Dehydration (Fluid Therapy)

- Restore blood volume and perfusion of tissues
- Infusion of isotonic saline (0.9% sodium chloride) at a rate of 15-20 ml/kg/hour or lactated Ringer solution “a less acidic solution, but usually normal saline is used”.

2. Hyperglycemia (Short acting Insulin)

- Subcutaneous absorption of insulin is reduced in DKA because of dehydration; therefore, using intravenous routes is preferable.
- usual starting dosage is about 0.1 U/kg/h
- Insulin stops lipolysis and promotes degradation of ketone bodies.

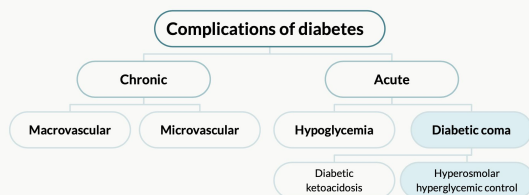
3. Electrolyte deficits (Potassium therapy)

- Potassium replacement must be initiated. “ □insulin-> □K uptake by peripheral cells-> □K in blood (hypokalemia). That’s why K should always be given with insulin therapy “
- Potassium is added to infusion fluid to correct the serum potassium concentration (to prevent insulin therapy-produced hypokalemia).

4. Ketoacidosis (Bicarbonate therapy)

- For correction of metabolic acidosis.
- Bicarbonate therapy should be used only if the arterial pH < 7.0 after 1 hour of hydration, (sodium bicarbonate should be administered every 2 hours until the pH is at least 7.0). “Bicarbonate is not always administered.always start with rehydration, if PH isn’t rebalanced go for bicarbonate”

Hyperosmolar hyperglycemic syndrome (HHS)



- It is diagnosed in persons with type 2 diabetes
- It is characterized by profound hyperglycemia and dehydration.
- It is associated with inadequate oral hydration.
- It is common in elderly patients with the use of medication that elevates the blood sugar or causes dehydration, such as phenytoin, steroids, diuretics, and calcium channel blockers; and with hemodialysis.

Diagnostic criteria	
<ul style="list-style-type: none"> ○ The diagnostic hallmarks are declining mental status ○ a plasma glucose >600 mg/dL, 	<ul style="list-style-type: none"> ○ a calculated serum osmolality >320 mmol/L. ○ Persons with HHS are not acidotic unless DKA is also present.
Treatment	
<ul style="list-style-type: none"> ○ The treatment of HHS centers around aggressive rehydration and restoration of glucose and electrolyte homeostasis ○ The rate of correction of these variables must be monitored closely. ○ Low-dose insulin therapy may be required 	

Comparison between Hypoglycemic and Hyperglycemic coma

Type of coma	Hypoglycemic coma (Excess insulin)	Diabetic Ketoacidosis Hyperglycemic coma (Too little insulin)
Onset	Rapid	Slow - Over several days
Acidosis and 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, sometimes convulsions	General depression
Blood sugar	Lower than 70 mg/100cc	Elevated above 200 mg/100cc
Ketones	Normal	Elevated



MCQ

1. A 45-year-old male with a known history of type 2 diabetes presents to the emergency department unconscious. His wife reports that he has been feeling unwell for the past few hours and has been acting confused. On examination, he is drowsy, disoriented, and his blood glucose level is found to be 40 mg/dL (2.2 mmol/L). What is the best treatment to give?

A. dextrose tablets

B. glucose gel

C. Glucagon

D. None

2. Which of the following causes leukopenia?

A. Diazoxide

B. Octreotide

C. Lanreotide

D. None

3. Which of the salines is used for DKA

A. 0.45% NaCl

B. 0.9% NaCl

C. None

D. Both

4. Which electrolyte has to be added in DKA treatment

A. Na⁺

B. K⁺

C. Mg⁺⁺

D. None

5. An 80-year-old male with a history of hypertension presents to the primary care clinic complaining of increased thirst, frequent urination, and unexplained weight loss over the past few weeks. He has been taking a medication for his hypertension for the past six months. On examination, his blood pressure is well controlled, but his blood glucose level is found to be over 600 mg/dL. What is the most likely cause of his hyperglycemia?

A. Calcium channel blocker induced HHS

B. Development of type 2 diabetes

C. worsening of his hypertension

D. Normal levels for an elderly patient

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