DIABETIC KETOACIDOSIS (DKA)

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- Diabetic ketoacidosis (DKA) is an acute, major, life-threatening complication of diabetes that mainly occurs in patients with type 1 diabetes, but it can occur in some patients with type 2 diabetes.
- DKA is a complex disordered metabolic state characterized by hyperglycemia, ketoacidosis, and ketonuria.
- DKA has high morbidity and mortality in paediatic patients.

Pathophysiology

- Insulin normally elevates cellular uptake of glucose from the blood
- Insulin defciency with rised counter regulatory hormones (glucagon,cortisol, catecholamines, GH)
- Can occur with lack of insulin (non-adherence, inadequate dosage, 1st presentation) or increased stress (surgery, infection, exercise)

- Unopposed hepatic glucose production hyperglycemia cause osmotic diuresis then dehydration and electrolyte disturbance Na+ (water shift to ECF causing pseudohyponatremia)
- Fat mobilization increases FFA then ketoacids then metabolic acidosis

- As a result of hyperglycemic hyperosmolality, potassium shifts along with water from inside cells to the extracellular space and is lost in the urine.
- Insulin normally promotes cellular potassium uptake but is absent in DKA, compounding the problem.

- A total body potassium deficit therefore develops in the body, although serum potassium may be normal or even paradoxically elevated.

Signs and symptoms

- **Polyuria ,Polydipsia**
- **Recent weight loss**
- **Nausea and vomiting**
- **Signs of volume depletion** (i.e., dry mucous membranes, decreased skin turgor), *hypotension*, circulatory collapse

Neurological abnormalities

- **Altered mental status**
- **Lethargy**
- **coma**
- Other neurological exam abnormalities such as blurred vision and weakness

- **Rapid onset** (< 24 h)
- **Abdominal pain**
- **Fruity odor on the breath** (from exhaled **acetone**)
- **Hyperventilation: Kussmaul respirations**: deep breaths at a normal respiratory rate

Diagnostic

Initial approach

- ABCs: airway, breathing, and circulation
- Mental status check
- **Fingerstick glucose**
- History (taken from family members or friends if need be), including possible precipitating factors

Diagnostic tests

- ↑ Serum glucose(< 600 mg/dL > 250 mg/dL ,Urine ketones

Serum electrolytes, including bicarbonate (with anion gap calculation)

- Hypertonic hyponatremia
- But if fluid loss due to osmotic diuresis is not replaced, hypernatremia
- serum bicarbonate is reduced
- Urine dipstick with increased glucose and ketones
- Osmolarity (increased to >290 mOsm/L)

Additional tests

- Indications: may be ordered to rule out serious precipitating factors, such as myocardial infarction, pneumonia, or pancreatitis
- ↑ Blood urea nitrogen (BUN) and creatinine
- Full blood count,ABG
- Blood or urine cultures
- ECG
- Chest x-ray

Management

Principles

- Admission in high dependency area of Medical Ward or ICU.
- Correction of fluid loss with intravenous fluids
- Correction of hyperglycemia with insulin
- Correction of electrolyte disturbances, particularly hypokalemia
- Correction of acid-base balance but most of time corrected with above mentioned measures
- Treatment of concurrent infection, if present

Correction of fluid loss

- **Normal Saline** or Ringer's Lactate
- Administer 1-3 L during the first hour
- Administer 1 L during the second hour
- Administer 1 L during the following 2 hours
- Administer 1 L every 4 hours, depending on the degree of dehydration

Correction of hyperglycemia

critical to resolve acidosis, not only hyperglycemia

Do not use with hypokalemia , until serum K+ is corrected to >3.3 mmol/L

– short-acting insulin(R)
– maintain on 0.1 U/kg/h insulin R infusion
– check serum glucose hourly

If blood glucose stable and urine ketones negative, then stop insulin infusion and start standard insulin regimen

K+ replacement

with insulin administration, hypokalemia may develop

- if serum K+<3.3 mmol/L, hold insulin and give 40 mEq/L K+ replacement
- if serum K+3.3-4.5 mmol/L, give 20 mEq/L K+ replacement
- when K+ 4.5-6.0 mmol/L add KCL 10 mEq/L IV fluid to keep K+ in the range of 3.5-5 mEq/L

Treatment of intercurrent infection

- Start empiric antibiotics on suspicion of infection until culture results are available

REFERENCES

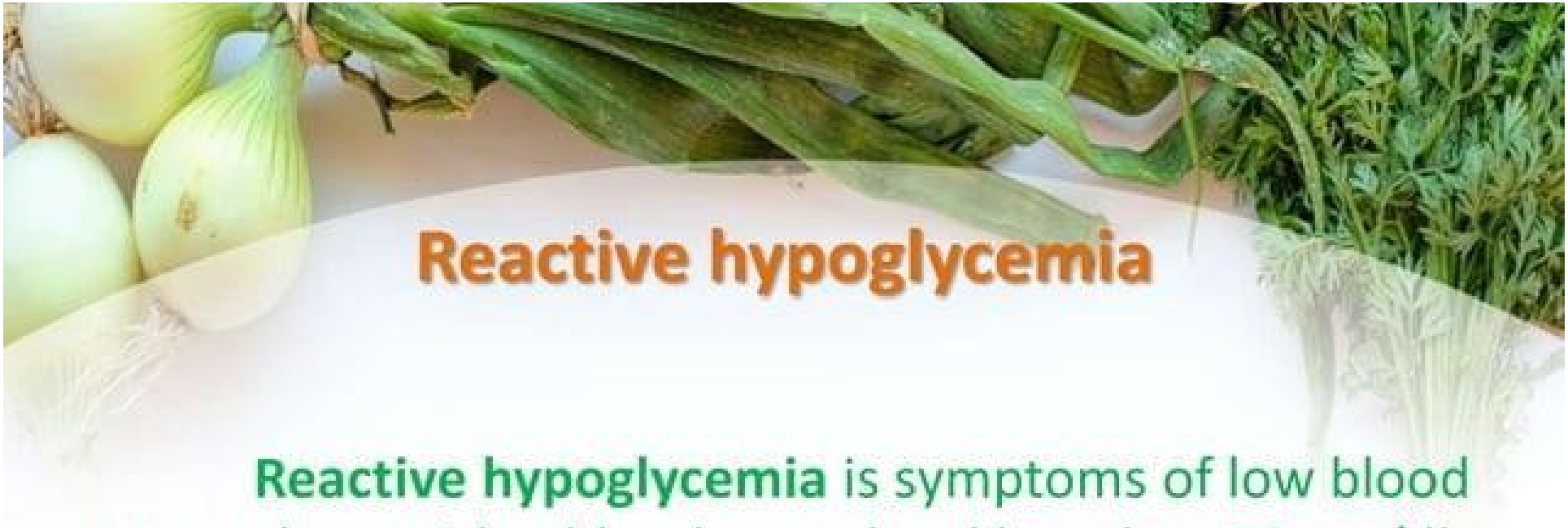
- ✓ www.uptodate.com
- ✓ www.amboss.com
- ✓ Toronto Notes 34th Edition http://www.moh.gov.rw/fileadmin/templates/Clinical/Internal-Medicine-Clinical-Treatment-Guidelines-9-10-2012-1.pdf
- ✓ Kumar and Clark's Clinical Medicine, 9th Edition

- Hypoglycemia is a medical term for low blood sugar (glucose).
- In most people, a normal level of blood sugar is within a range of 70 to 99 mg/dL.
- Hypoglycemia can be a concern for people with diabetes, but it also affects people who do not have diabetes.

- Two conditions that can affect people without diabetes are
  - postprandial syndrome and
  - reactive hypoglycemia.

Postprandial syndrome(after eating)

Postprandial syndrome is when someone develops symptoms of low blood sugar within 4 hours after eating but blood sugar doesn't actually drop below normal. Having these symptoms may be related to eating a high carbohydrate meal.



Reactive hypoglycemia

Reactive hypoglycemia is symptoms of low blood sugar along with a blood sugar level less than 70 mg/dl.

This too most often occurs about 4 hours after a meal and symptoms improve right away with intake of carbohydrates.

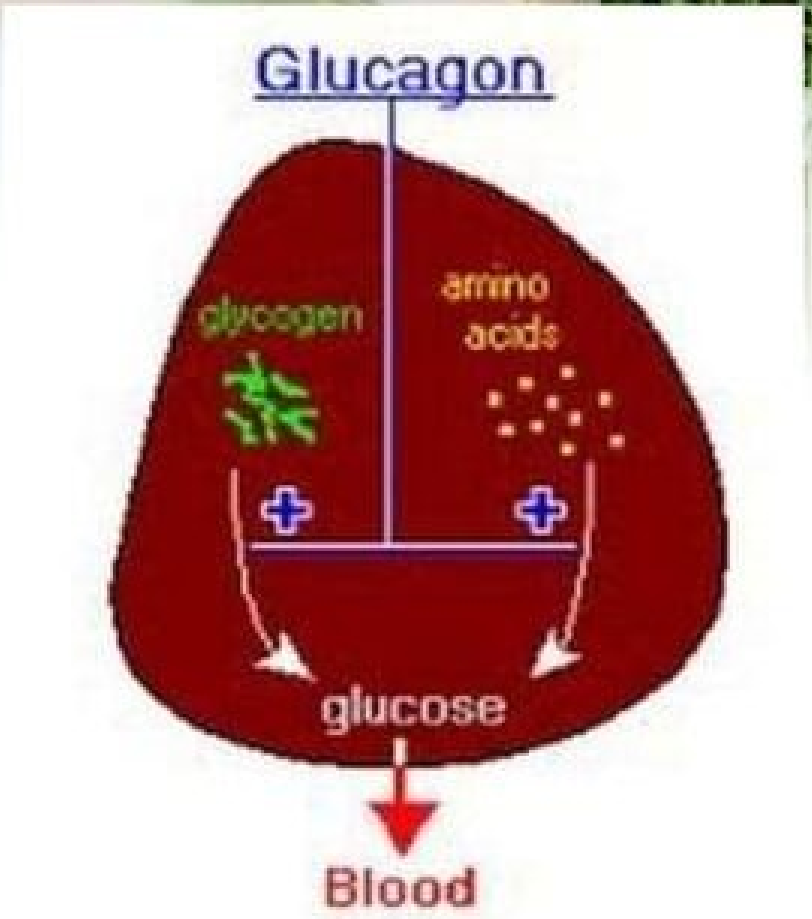
SYMPTOMS

- Hunger
- Sweating
- Shakiness
- Weakness
- Fatigue
- Nausea/vomiting
- Numbness/coldness in arms or legs
- Mood swings
- Double vision/blurred vision
- Fast pulse rate
- Headache
- Anxiety
- Flushing
- Confusion
- Irritability

Causes of Hypoglycemia

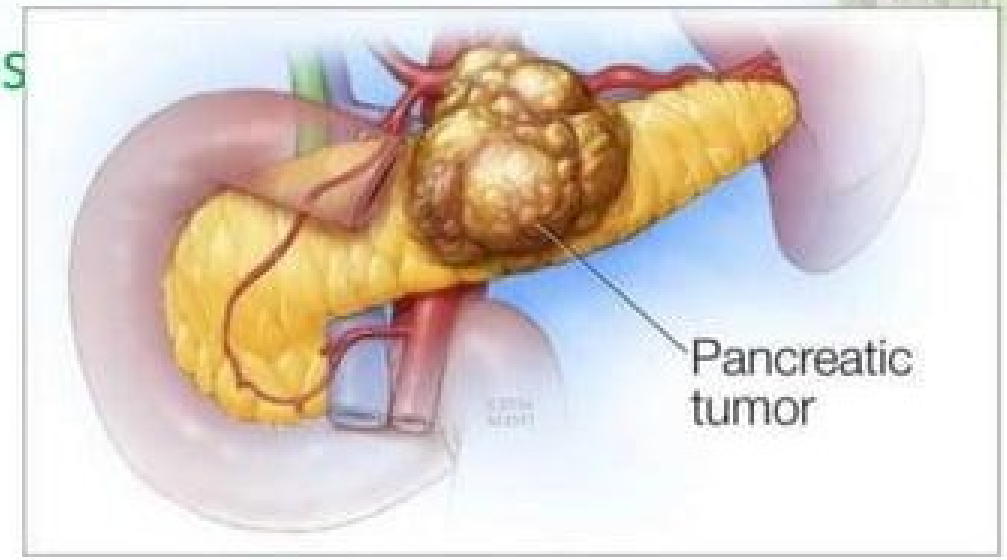
- It most commonly happens when a person with diabetes has taken too much insulin

- Lack of glucagon (hormone that is secreted from the pancreas that raises blood glucose levels)



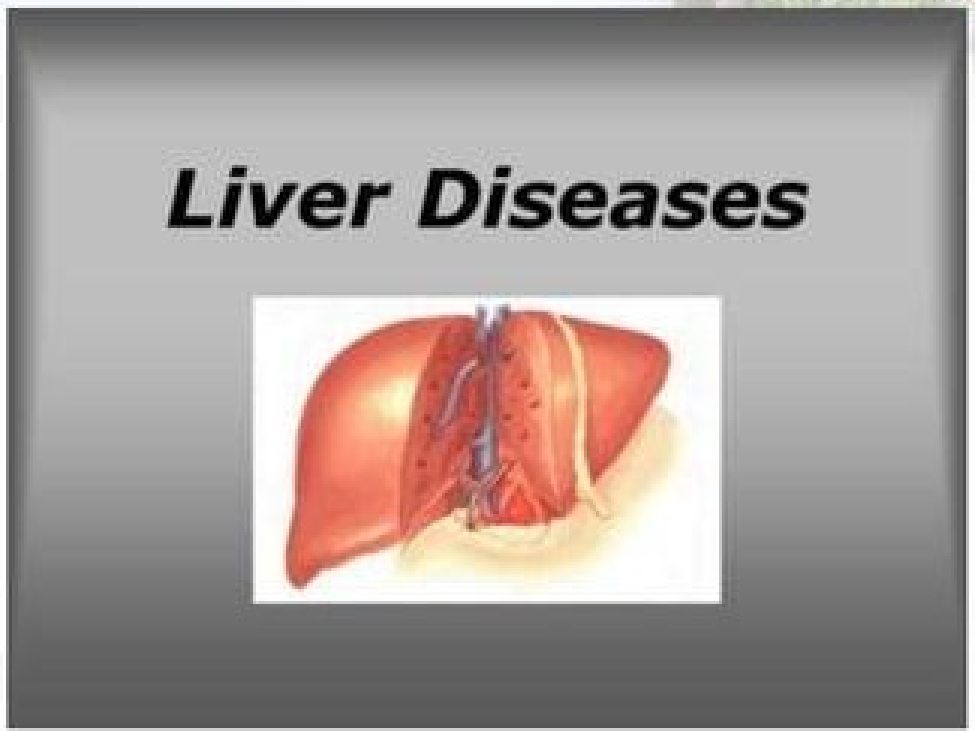
- Excessive alcohol consumption: drinking heavily can block liver from releasing stored glucose

- Tumor of pancreas known as an Insulinoma



Complications

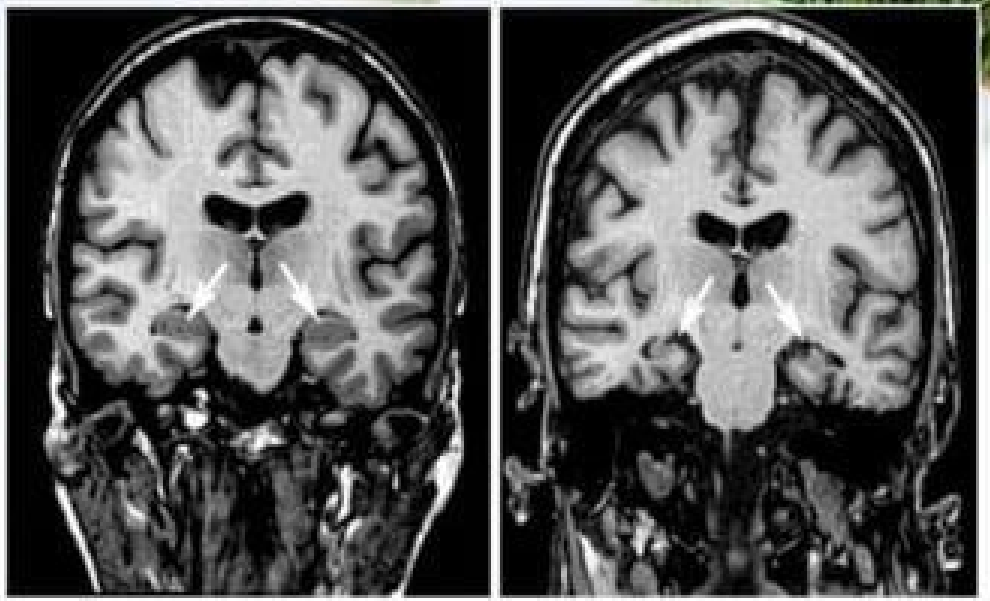
- Liver disease and/or failure which leads to Jaundice (the yellowing of the skin, mucous membranes, and other parts of the body due to waste build-up.)



- Insomnia-liver failure causes a build-up of urea and increases tension.

- Seizures (involuntary convulsions)

- Retrograde amnesia (cannot remember things before the injury)



Healthy brain

Amnesic brain

Dietary Modification

- **Limit foods high in sugar and concentrated sweets.**

Eating these foods can cause a rapid increase in blood glucose. This may lead to excessive increase of insulin, resulting in a rapid fall in blood glucose.

Reduce intake of foods and drinks that have caffein

- Caffeine stimulates the production of adrenaline and can cause the same symptoms as hypoglycemia.

Try to eat every 3 to 4 hours.

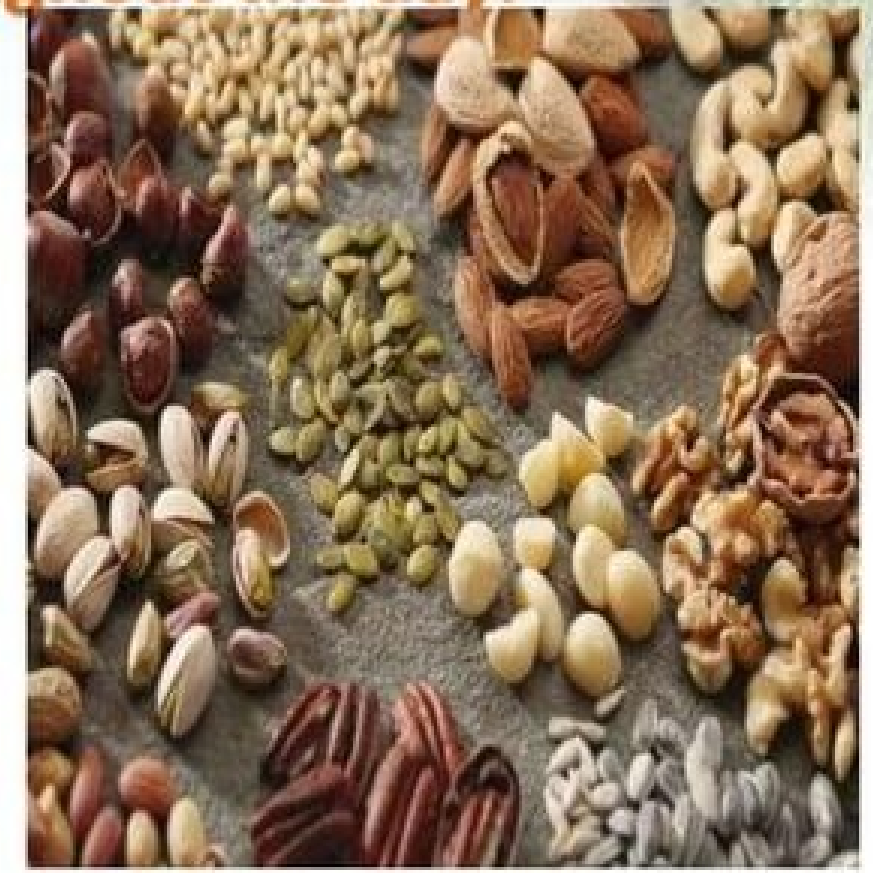
- Eating many small meals and snacks each day rather than 3 larger meals can help to regulate the amount of glucose in your bloodstream.

Choose whole grains and increase high fiber fo

- Whole grains take longer to break down. This helps to keep blood glucose levels more consistent.

Enjoy foods high in healthy fats in small amounts throughout the day.

- Fats are also digested slowly and can help to balance the blood sugar.




Thank You!