DIABETES MELLITUS.

Diabetes mellitus is a clinical syndrome due to relative or absolute lack of Insulin or decreased effectiveness of Insulin.

Classification.

1. Type I (IDDM) : Insulin dependent DM.
   : circulating Insulin level is deficient.
2. Type 2 (NIDDM) : Insulin resistant.
   ↳ Non insulin dependent DM.
   ✓ Here circulating insulin level is normal or nearly normal.
3. Diabetic prone states.
   - gestational diabetes mellitus.
   - impaired glucose tolerance.
   - impaired fasting glycemia.
4. Secondary to other diseases.

Cushing's disease
Thyrotoxicosis.
steroid therapy
chronic pancreatitis
pancreatic calculi.

Type - 1 DM - features

- Due to decreased insulin production.
- Juvenile diabetes comes under this group.
- onset is below 30 years of age.
- Dependant on insulin injections.
- They are more prone to ketosis.
- Autoimmune basis is attributed to most of case.

Type - 2 DM - features

- Most common type.
- There is only decreased response to insulin - insulin resistance.
- so there is relative insulin deficiency.
- seen in individuals above 40 years of age.
- less prone to develop ketosis.
- These patients have high plasma insulin levels.
- Insulin receptor gene is defective.
- 60% of type 2 patients are obese
  40% non obese.

Metabolic Syndrome.

- Insulin resistance.
- obesity
- Hyperlipidemia. → Increased risk for coronary artery disease.
- Increased BP
- Elevated waist circumference.

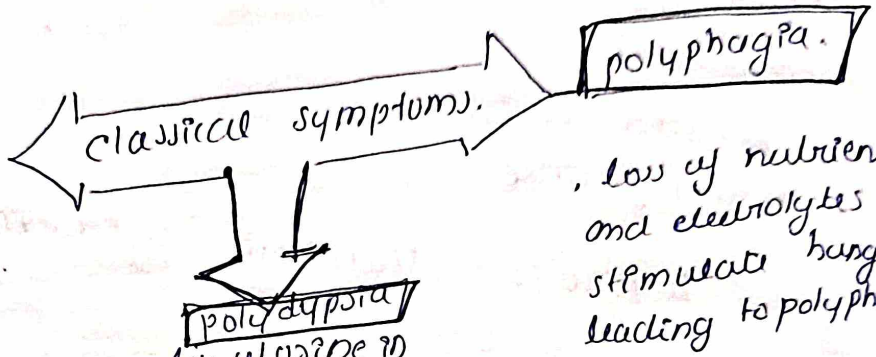
Diagnosis : metabolic syndrome.

Criteria for diagnosing metabolic syndrome.

- Elevated wais circumference.
  - men > 90cm
  - women > 80cm.
- Elevated TG (>150 mg/dL)
- Elevated BP (>130/85 mmHg)
- Elevated FBS (>100 mg/dL)
- other parameters : coagulation abnormalities, microalbuminuria, NASH (non alcoholic steatohepatitis)

and increased CRP.

Clinical manyestation/ Symptoms of Diabetis mellitus



- glucose is osmotically active.
- It draws large amount of water along with it when excreted.
- This causes polyuria or osmotic diuresis.

- loss of urine in large quantities leads to thirst.

- loss of nutrients and electrolytes stimulate hunger leading to polyphagia

Other features.

- Extreme fatigue & weight loss
  - There is loss of weight due to excessive breakdown of tissue fat and protein.
- when blood sugar level shoots above the renal threshold glucose appears in urine. This is known as glycosuria.

- As the tissues cannot utilize glucose there is extreme weakness and tiredness.
- continued loss of water and electrolytes leads to dehydration

Metabolic Derangements in Diabetes. {complications}.

I. change in carbohydrate metabolism.

- There is decreased uptake of glucose by peripheral tissue.
- rate of glycolysis decreased.
- glycogenesis is inhibited.
- glycogenolysis is stimulated.
- Gluconeogenesis is stimulated.

All these leads to increased blood sugar level.

II. change in lipid metabolism.

Increased mobilization of fat from adipose tissue.

↓

oxidation of fat.

↓

accumulation of acetyl CoA

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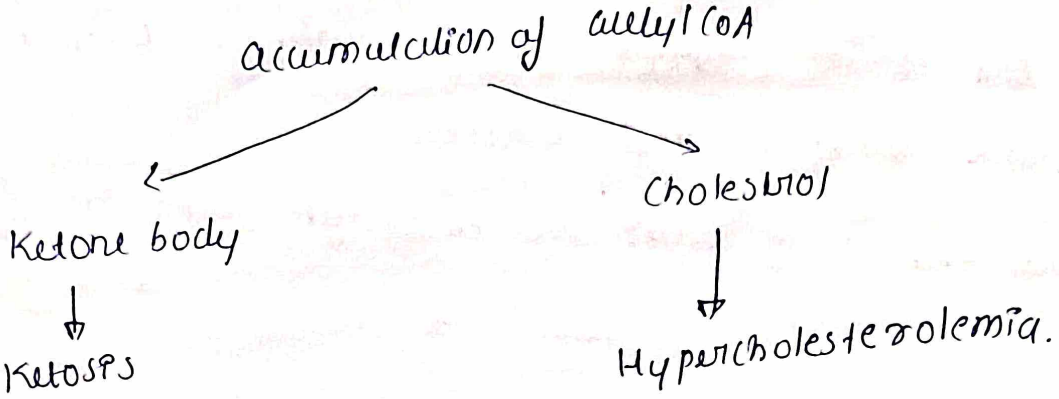


III. Changes in protein metabolism.

- There is increased catabolism of tissue proteins.
- protein synthesis is decreased.

IV. Changes in water & electrolyte metabolism.

- dehydration and electrolyte imbalance is common
- Ketone bodies formed are acidic in nature. This leads to decrease in pH of blood & acidosis.
- These acidic substances are buffered by plasma HCO_3, which will lead to depletion of plasma HCO_3.

Complications of Diabetes mellitus.

1. Acute complications.

1. Diabetic Ketoacidosis (DKA) ✓Impt.

- Ketosis is more common in type 1 DM.
- deficiency of insulin promote lipolysis, which results in over production of acetyl CoA.
- acetyl CoA is converted to Ketone bodies → Ketosis.
- Ketone bodies are acidic, so the pH of blood is lowered, this results in diabetic Ketoacidosis.
- In diabetic Ketoacidosis, as a part of compenscatory pH regulation mechanism the respiratory rate increases - Kussmaul's respiration.
- It is associated with fruity odour of breath & dehydration The fruity odour is from volatile acetone.
- Diabetic Ketosis if untreated leads to coma & finally DEATH

2. Hyperosmolar Non-Ketotic coma.

- Due to elevation of glucose to very high levels (900 mg/dl or more).
- It increases osmolality of ECF.
- Osmotic diuresis leads to dehydration.
- coma results from dehydration of cerebral cell due to hyper tonicity of ECF.

2. Ladic Acidosis.

- ~~due to elevation of glucose to~~
- rare complication.
- during hypoxia, anaerobic glycolysis increase and lactate production increases.
- It was seen when diabetis is treated with oral anti diabetic drug, biguanides (which inhibit TCA cycle) in earlier days.

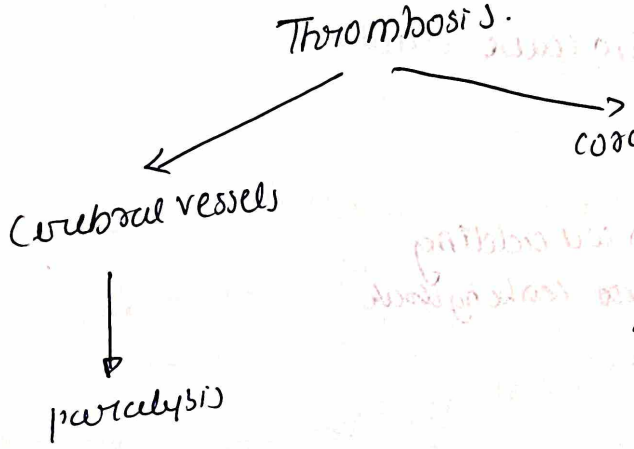
biguanides.

II. CHRONIC COMPLICATIONS.

(1) vascular complications.

The basement membrane of vessels are thickened due to atherosclerosis, which leads to intravascular thrombosis.

- Thrombosis of small vessels are called. microangiopathy.



(2) Renal Complications.

- It is characterized by proteinuria and renal failure, This condition is called kimmelstiel wilson syndrome or diabetic nephropathy.
- microalbuminuria (30-300 mg albumin per day in urine). can occur in renal involvement of diabetes mellitus.

(3) Opthalmic complications.

- diabetic cataract due to increased rate of Sorbitol formation.
- glycation of retinal protein and retinal microvascular involvement leads to retinopathy and blindness.
- glycation of lens proteins also cause cataract formation.
- glycation : no enzyme
  glycosylation : enzyme ✓
  } both are adding glucose carbohydrate.

(4) Nervous tissue complication.

Diabetic neuropathy.

- Blood supply to peripheral nerve gets blocked.
  (diabetic polyneuritis).
- paraesthesia is common. sensory deficit leads to foot ulcers.

Laboratory Investigation in DM.

(1) detection of glycosuria.

- Urine benedicts test or glucose oxidase test.
- only when blood sugar is above the renal threshold glucose appears in urine.

• detection of hyperglycemia.

- normal fasting blood sugar level range from 70 - 110 mg%.
- Two hour post prandial blood sugar level is normally less than 140 mg%.
- By two and half hours blood sugar return to fasting level in normal subjects.

3 type of samples are used to diagnose DM.

- fasting - FBS
- post prandial - PPBS.
- Random - RBS.