



# University Of Fallujah College Of Medicine Medical Biochemistry



## Lecture 2: Estimation of Blood Glucose

Stage: 2<sup>nd</sup> Year

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Department: Medical Biochemistry

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# Learning objectives

**Differentiate**

**Differentiate between the main blood glucose tests (RBS, FBS, P.P.S, GTT, HbA1c).**

**Explain**

**Explain the principles, indications, and interpretation of each test.**

**Identify**

**Identify normal and abnormal glucose levels and their clinical significance.**

**Recognize**

**Recognize factors affecting the accuracy of glucose estimation and sample handling.**



## Diabetes Mellitus (DM)

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graph TD; A[Diabetes Mellitus (DM)] --> B[Symptoms of hyperglycemia]; B --> C[Types of DM:];
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It is a group of metabolic disorders characterized by high blood sugar (Hyperglycemia) resulting from defects in insulin secretion, insulin action, or both.

## Symptoms of hyperglycemia

Polyuria, Glycosuria, Polydipsia, and Polyphagia.

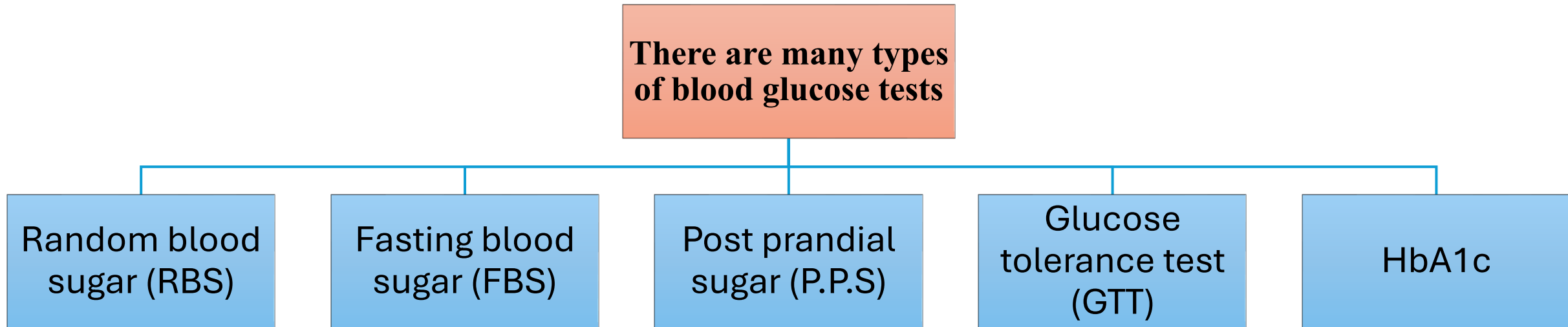
## Types of DM:

**Diabetes mellitus type I**

**Diabetes Mellitus Type II (Adult onset)**

**Gestational diabetes**

# Estimation of Blood Glucose



***Random blood glucose (RBS):*** (Normal: Less than 140 mg/dl )

- Measures blood glucose **at any time of the day.**
- Quick **screening** for diabetes, especially in emergencies (emergency test) or when symptoms (polyuria, polydipsia, weight loss) are present.
- Not used alone for definitive diagnosis.
- No special preparation is needed
- **$\geq 200$  mg/dL** with classic symptoms → diagnostic of diabetes.
- Poor reproducibility; affected by recent meals.
- The doctor should check the blood glucose level on another day using a fasting glucose test or OGTT to confirm the diagnosis of diabetes.

## ***Fasting blood glucose (FBS):* ( 70 - 110 mg/dL )**

- Glucose level measured after **8–12 hours of fasting**.
- Common **screening and diagnostic tests** for diabetes and prediabetes.
- Standardized; less variability.

### **Interpretation:**

- a) IF concentration is **70-110 mg/dL**, it is considered **normal** blood glucose.
- b) IF concentration is **110-126 mg/dL**, it is impaired glucose utilization.
- c) IF concentration is **>126 mg/dl**, it is diabetes mellitus.

## Postprandial sugar (P.P.S) :

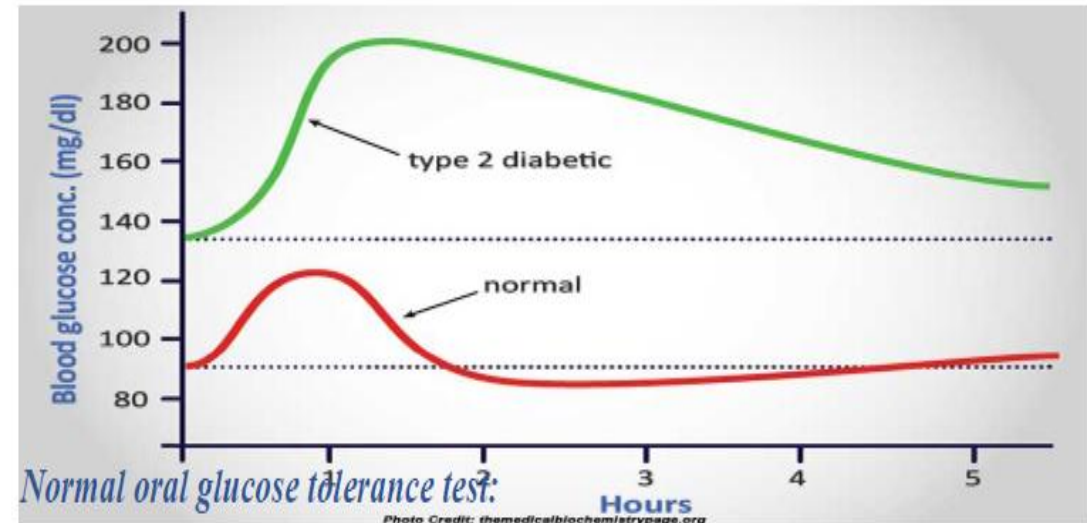
- Measures blood glucose levels following a meal. (or after 75 g glucose in some protocols).
- A set amount of glucose is taken (**75 g**). A blood test is taken two hours after ingesting the glucose.
- Assesses glucose tolerance and post-meal insulin response.
- Helpful in gestational diabetes or early diabetes detection.
- Detects post-meal hyperglycemia that fasting tests might miss.

### Interpretation:

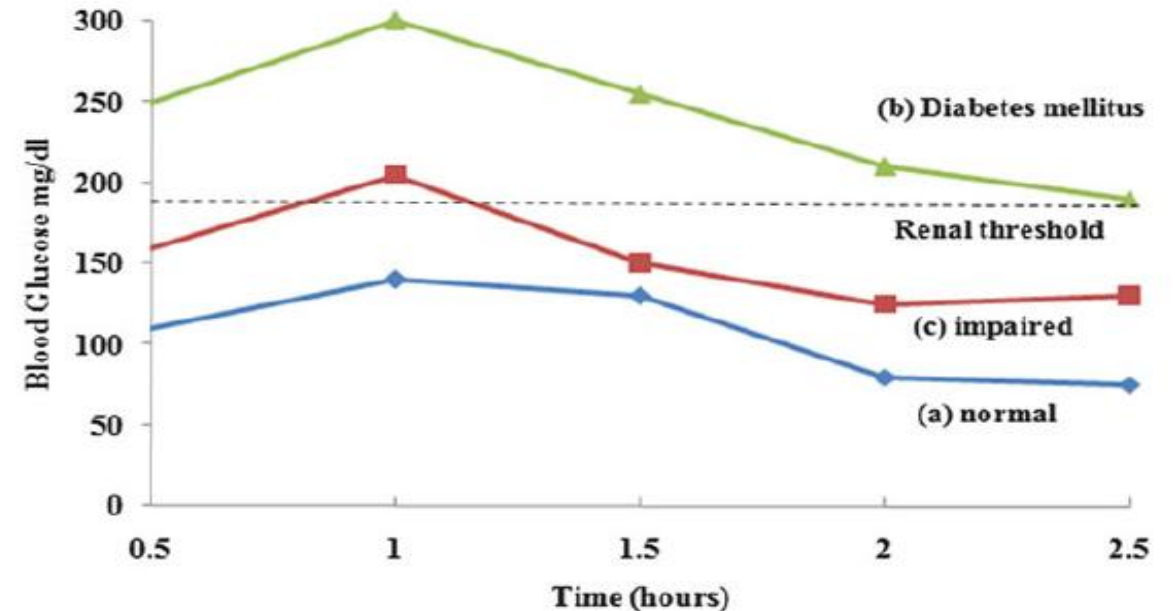
- a) IF concentration is 70-140 mg/dL, it is considered normal blood glucose.
- b) IF concentration is 140-200 mg/dL, it is impaired glucose utilization.
- c) IF concentration is >200 mg/dl, it is diabetes mellitus.

## Glucose Tolerance Test (GTT):

- Measures the body's ability to metabolize a **standard glucose load** (typically 75 g glucose orally).
- **Gold standard** for diagnosing **impaired glucose tolerance** and **gestational diabetes**.
- Used when FBS or HbA1c are borderline.
- **You will first have blood taken to measure your blood glucose level before the test**
- Before the test, you will be asked not to eat or drink certain fluids for up **to 8 to 12 hours** before the test.
- Patient takes glucose orally **75gm**, dissolved in **250 ml** water.
- Further blood samples will then be taken every 30 minutes.
- The test could take up to 3 hours.

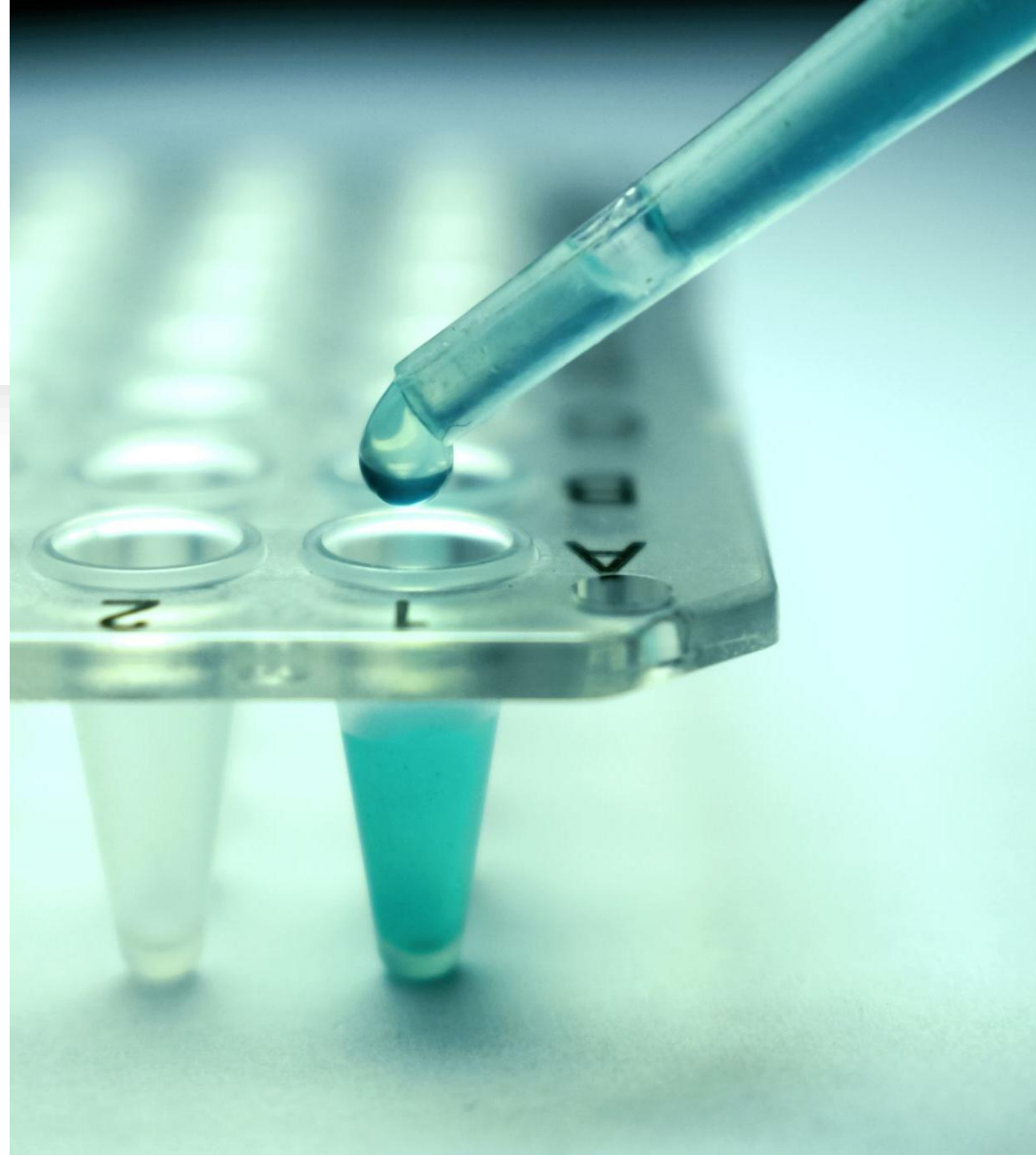


- The test is usually carried out in the morning.
- Following oral intake of glucose, the level rises and reaches a peak within 1 h and then comes to normal fasting levels within 1.5–2 h because of insulin secretion and utilization, and storage of glucose.
- After 2 h, it should be below 120 mg/dL.
- In diabetes mellitus, the glucose tolerance is decreased and glucose level increases to much higher levels after 1 h of glucose intake and does not reach a normal level even after 2 h due to low insulin levels or decreased cellular response toward insulin.



# Sample collection

- Serum/plasma sample is used.
- For oral GTT, draw a fasting sample and then at 30, 60, 90, and 120 minutes after glucose intake.
- In case of pregnancy, draw samples at fasting and at 60, 120, and 180 min after glucose intake.
- Serum or plasma should be separated as quickly as possible within 30 minutes.
- Use sodium fluoride as anticoagulant if serum separation is delayed.
- Glucose is metabolized at room temperature at a rate of 7 mg/dl/hour. The rate of metabolism is higher with bacterial contamination or leukocytosis.



## PROCEDURE

### Manual method

Let stand reagent and specimens at room temperature.

|  |                    |
|--|--------------------|
| Reagent  | 1000 $\mu\text{L}$ |
| Calibrator, Control or Specimen  | 10 $\mu\text{L}$   |
| Mix. Let stand for 10 minutes at 37°C or 20 minutes at room temperature.<br>Read absorbance at 500 nm (460-560) against reagent blank.<br>Coloration is stable for 15-20 minutes at 37°C, and then slowly decreases. |                    |

# Thank you

