

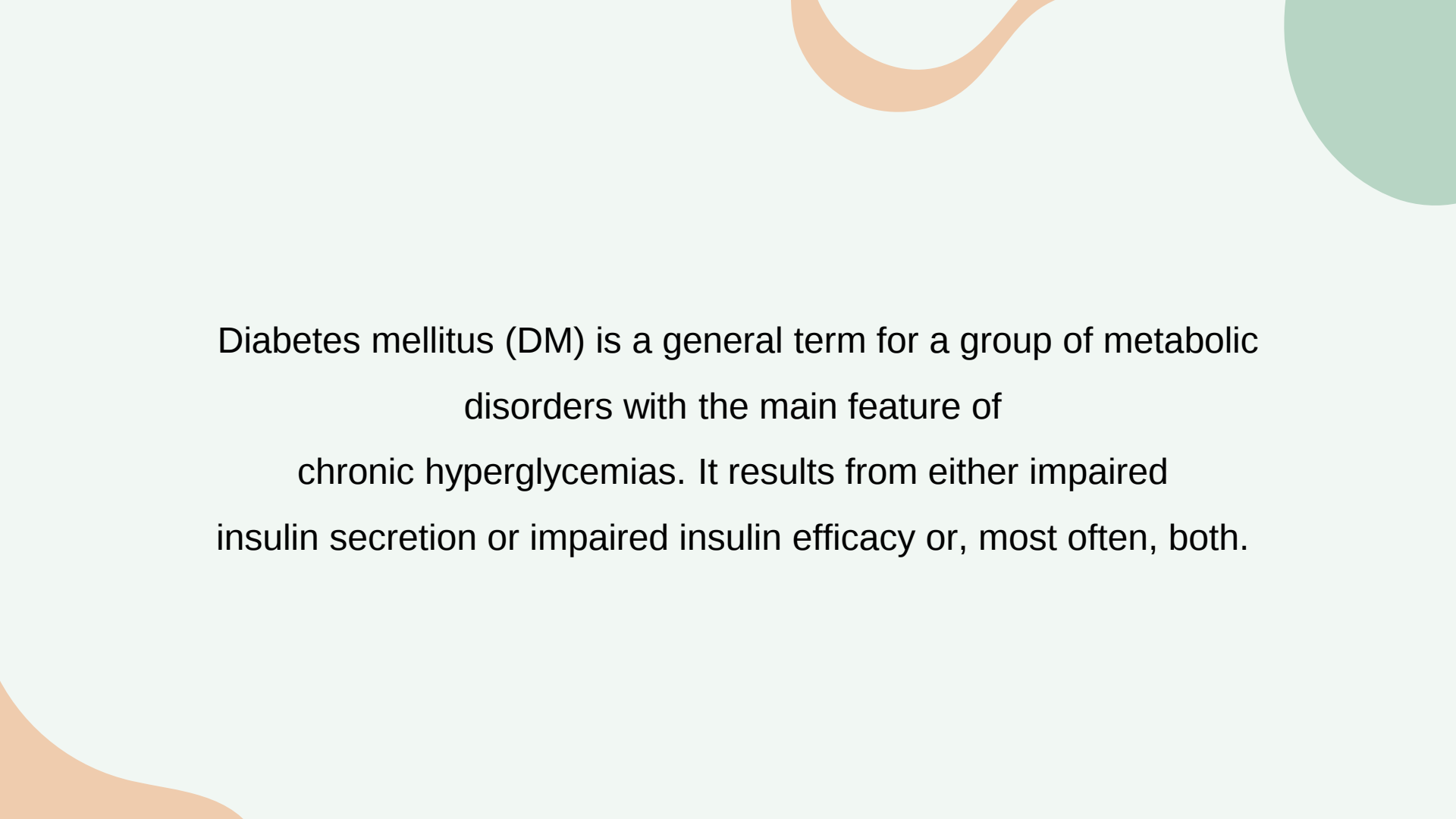


Clinical Chemistry

Determination of blood glucose

Introduction

- Glucose is the major carbohydrate present in blood .Its oxidation in cells is the source of energy for the body.
- Insulin facilitates glucose entry into the cells.
- Increased levels of glucose (hyperglycemia): are found in diabetes mellitus ,hyperparathyroidism, pancreatitis, renal failure.
- Decreased levels (hypoglycemia): are found in insulinoma, hypothyroidism, hypopituitarism and extensive liver disease.



Diabetes mellitus (DM) is a general term for a group of metabolic disorders with the main feature of chronic hyperglycemias. It results from either impaired insulin secretion or impaired insulin efficacy or, most often, both.

Categories of DM

01 Type 1 diabetes mellitus

Insulin dependent diabetes mellitus (IDDM). which characterized by absolute insulin deficiency (due to auto immune beta-cell destruction which occur by contribution of one or more environmental factors).

02 Type 2 diabetes mellitus

Non-insulin dependent diabetes mellitus (NIDDM),is a complex disorder of glucose metabolism, which results from combination of peripheral insulin resistance and impaired insulin secretion , and accounts for most cases of diabetes mellitus worldwide

03

Gestational diabetes mellitus (GDM)

Diabetes diagnosed in the second or third trimester of pregnancy.

04

Specific types of diabetes due to other causes

Such as neonatal diabetes and maturity-onset diabetes of the young (MODY).

05

Latent autoimmune diabetes in adults (LADA).

Diagnostic Criteria of type 2 diabetes mellitus

Fasting blood sugar

Fasting blood sugar (FBS) ≥ 126 mg/dL (7.0 mmol/L)

1

Random blood sugar

Random Blood Sugar (RBS) ≥ 200 mg/dL (11.1 mmol/L)

2

Hemoglobin A1c

HbA1C $\geq 6.5\%$

3

Glucose tolerance test.

Glucose Tolerance Test

Two Hour Blood Sugar ≥ 200 mg/dL (11.1 mmol/L)

4

SYMPTOMS

1. Frequent urination (polyuria).
2. Excessive thirst (polydipsia).
3. Extreme hunger or constant eating (polyphagia).
4. Unexplained weight loss.
5. Tiredness or fatigue.
6. changes in vision.
7. Numbness or tingling in the extremities.
8. Slow healing wounds or sores.
9. Abnormally high frequency of infection.

Complication of diabetes mellitus

Macrovascular Complication

Macrovascular complications occur when the DM affect large blood vessels of heart and brain causes: heart disease , hypertension and stroke

Microvascular Complication

Microvascular complications when the DM affect small blood vessels.

- Including: diabetic nephropathy, retinopathy, and neuropathy , which are the major causes of morbidity and mortality in diabetic individuals worldwide and current therapies are still unsatisfactory
- Diabetes is well known as the leading cause of blindness, end-stage renal disease (ESRD) and limb amputation

Abnormal Findings

Increased level (hyperglycemia)

Diabetes Mellitus
Acute Stress Response
Cushing Syndrome
Acromegaly
Chronic Renal Failure
Glucagonoma
Acute Pancreatitis
Diuretic Therapy
Corticosteroid Therapy

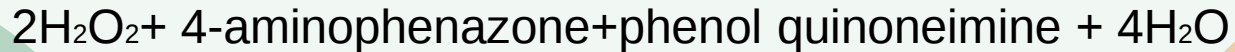
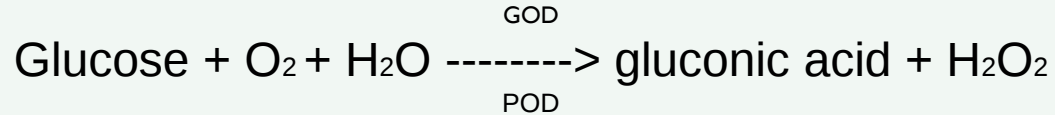
Decreased level (hypoglycemia)

Insulinoma
Hypothyroidism
Hypopituitarism
Addison Disease
Extensive Liver Disease
Insulin Overdose
Starvation

PRINCIPLE

Glucose is oxidized by glucose oxidase to gluconate and hydrogen peroxide according to the following equation :

REACTION PRINCIPLE



STABILITY AND PREPARATION OF REAGENTS

R1a. Buffer

Contents ready for use. Stable up to the expiry date when stored at +2 to +8C.

R1b. GOD-PAP Reagent

Reconstitute the contents of one vial of Reagent R1b with a portion of Buffer R1a and then transfer entire contents to bottle R1a, rinsing bottle R1b several times. The working reagent is stable for 3 months at +2 to +8C or 5 days at +15 to +25C.

CAL. Standard

Contents ready for use. Stable up to the expiry date at +2 to +8C.

Procedure

	Blank	Standard	Sample
Reagent	1000 μ l	1000 μ l	1000 μ l
Standard	—	20 μ l	—
Sample	—	—	20 μ l

Mix, incubate for 25 min at 15 - 25C or 10 min at 37C. Measure the absorbance of the standard (A standard) and the sample (A sample) against the reagent blank within 60 minutes.

Calculation

$$\text{Glucose concentration (mmol/l)} = \frac{A_{\text{sample}}}{A_{\text{standard}}} \times 100$$

Wavelength: 500 nm, Hg 546 nm

Cuvette: 1 cm path length

Temperature: 15 - 25C or 37C

Measurement: against reagent blank



Thank you for your listening