

Diabetes Mellitus

(Lecture 2)

Objectives

- 1. To illustrate differences between T1D and T2D.**
- 2. To give an account on glycosuria.**
- 3. To illustrate the diagnosis of diabetes.**
- 4. To give an account on oral glucose tolerance test (OGTT).**

Contents

- 1. Differences between T1D and T2D.**
- 2. Glycosuria**
- 3. Diagnosis of diabetes.**
- 4. Oral glucose tolerance test (OGTT).**

Comparison between T1D & T2D

Feature	Type 1 diabetes	Type 2 diabetes
Age at onset	Younger “mostly in children” (usually < 30 years)	Mostly in adults (usually > 30 years)
Onset of symptoms	Sudden (days or weeks)	Gradual (months or years ‘ asymptomatic’)
Body weight	Lean	Over weight or obese

Comparison between T1D & T2D

Feature	Type 1 diabetes	Type 2 diabetes
Prevalence	~10%	~90%
Ethnicity risk	Northern European	Asian, African, American- Indian
Pathogenesis	Autoimmune disease	No immune disturbance

Comparison between T1D & T2D

Feature	Type 1 diabetes	Type 2 diabetes
Heredity	HLA-DR3 and DR4 in > 90%	No HLA link
Concordance in identical twins	50%	>90%
Family history of DM	Uncommon	Common

Comparison between T1D & T2D

Feature	Type 1 diabetes	Type 2 diabetes
Other autoimmune diseases	Common	Uncommon
Autoantibodies	Present	Absent
Clinical	1. Insulin deficiency 2. $\pm$ Ketoacidosis 3. Ketonuria 4. Always need insulin	1. Partial insulin deficiency initially 2. No ketonuria 3. $\pm$ Hyperosmolar state 4. Need insulin with gradual <i>B</i>-cell failure

Comparison between T1D & T2D

Feature	Type 1 diabetes	Type 2 diabetes
C-Peptide	Disappears	Persists
Rapid death without insulin	Yes	No
Diabetic complications at diagnosis	No	25%

Renal Handling of Glucose

Normally, there is no glucose in urine, because the kidneys are able to reabsorb all of the filtered glucose from the renal tubules back into the circulation.

Renal threshold for glucose

Renal threshold for glucose:

The level of blood glucose that determine the absence or presence of glucose in urine (Glycosuria).

Normal renal threshold for glucose is: 180 mg/dl

When the blood glucose concentration exceeds 180 mg/dl, the proximal tubule becomes unable to absorb more glucose and begins to excrete glucose in urine. This point is called the **renal threshold for glucose**.

Glycosuria

The presence of glucose in urine

Types of Glycosuria

1. Diabetic glycosuria.

In patients with diabetes, when the blood glucose concentration exceeds 180 mg/dl, the proximal tubule becomes unable to absorb more glucose, and thus glucose appear in urine.

2. Renal glycosuria:

**Due to low renal threshold for glucose
(Less than 180 mg/dl)**

Causes include:

- 1. Pregnancy**
- 2. Cystinosis**
- 3. Fanconi syndrome**

3. Alimentary glycosuria (Lag Storage Curve):

Transient rise in blood glucose followed by glycosuria due to fast gastrointestinal absorption of glucose.

Causes include:

- 1. Hyperthyroidism**
- 2. Gastrostomy,**
- 3. Gastrojejunostomy**

Diagnosis of DM

In patients complains from symptoms suggesting DM
(**Polyuria, Polydipsia, Weight loss**):

1. Measure FPG or RPG. Diagnosis confirmed by:

Fasting plasma glucose (FPG): ≥ 7.0 mmol/l (≥ 126 mg/dl)

Random plasma glucose (RPG): ≥ 11.1 mmol/l (≥ 200 mg/dl)

2. Glycated haemoglobin (Hb A1c): ≥ 6.5 %

NOTE:

Two readings are needed in asymptomatic people.

Oral glucose tolerance test (OGTT) :

INDICATIONS OF OGTT:

1. **Impaired fasting glycaemia (IFG):**
FPG: 5.6 - 6.9 mmol/l (100-125 mg/dl)
2. **Impaired glucose tolerance (IGT):**
RPG: 7.8 – 11.0 mmol/l (140-199 mg/dl)
3. **Borderline blood sugar values**
4. **Symptoms suggesting DM with normal blood sugar values**
5. **Gestational diabetes**

HOW TO PERFORM OGTT?

Adult: 75 g glucose in 300 ml water.

Child: 1.75 g glucose/kg body weight.

Only a fasting and a 120-min samples are needed

Interpretation of OGTT:

Normal OGTT:

FPG: < 5.6 mmol/l

PPG: < 7.8 mmol/l

Impaired glucose tolerance:

FPG: < 7.0 mmol/l

PPG: $\geq 7.8, < 11.1$ mmol/l

Diabetes mellitus:

FPG: ≥ 7.0 mmol/l

PPG: ≥ 11.1 mmol/l