Diabetes Mellitus

Definition

A metabolic disorder of multiple etiology characterized by chronic hyperglycemia with disturbances of carbohydrates, fat and protein metabolism resulting from defects in insulin secretion, insulin action or both.

Types of DM

1. **Type 1 diabetes:** Due to autoimmune β-cell destruction, usually leading to absolute insulin deficiency.
2. **Type 2 diabetes:** Due to a progressive loss of β-cell insulin secretion frequently on the background of insulin resistance.
3. **Gestational diabetes mellitus (GDM):** Diabetes diagnosed in the second or third trimester of pregnancy that was not clearly overt diabetes prior to gestation.
4. **Specific types of diabetes due to other causes:** e.g. maturity-onset diabetes of the young [MODY], and drug - chemical induced diabetes (such as with glucocorticoid use), disease of the exocrine pancreas.
5. **Impaired glucose tolerance (IGT) and impaired fasting glycaemia (IFG):** Intermediate conditions in the transition between normal blood glucose levels and diabetes (especially type2)

Symptoms

- Polyuria. - Polydipsia. - Polyphagia. - Weight loss. - Blurred vision.
- Fatigability. - Tingling of hands & feet. - Slow healing. - Dry skin.

Epidemiology

- **Trends in prevalence of diabetes, 1980–2014, by country income group by WHO region:**
- **The prevalence of DM in eastren mediterranean region is the highest.**

Risk factors

- **Genetic factors:** autoimmune disease and viral infections may be risk factors in Type I DM.
- **Family history:** The risk of type 2 diabetes is higher (five to six fold) in those with both a maternal and paternal history of type 2 diabetes .
- **Obesity:** The risk of impaired glucose tolerance (IGT) or type 2 diabetes rises with increasing body weight.
- **Fat distribution:** The distribution of excess adipose tissue is another important determinant of the risk of insulin resistance and type 2 diabetes which is highest in those subjects with central or abdominal obesity, as measured by waist circumference or waist-to-hip circumference ratio.
- **Physical inactivity:** Significantly increased risk of type 2 diabetes.
- **Diet:** Consumption of low vitamin D consumption; early exposure to cow's milk or cow's milk formula; or exposure to cereals before 4 months of age increases risk of type 1 diabete.
- **Smoking:** cigarette smoking increases the risk of type 2 diabetes.
- **Infections:** Rare infections and illnesses can damage the pancreas and cause type 1 diabetes.
- **Pregnancy:** Pregnancy causes weight gain and increases levels of estrogen and placental hormones, which antagonize insulin.
- **Medications:** Thiazide diuretics, Adrenal corticosteroids, Oral contraceptives.
- **Physiological or emotional stress:** Causes prolonged elevation of stress hormone levels.

Diagnosis

1- Impaired Glucose Tolerance
2- Impaired Fasting Glucose
3- Gestational Diabetes Mellitus

According to new World Health Organization diabetes management guidelines, what is the best diagnostic criterion of diabetes?
HbA1C

Normal	- **Fasting Plasma Glucose:** ≤ 5.5 mmol/L (99 mg/dL) - **2-h Plasma Glucose:** < 140 mg/dl (7.8 mmol/L)
IGT[1]	- **Fasting Plasma Glucose:** ≥7.0 mmol/L (126 mg/dl) AND - **2-h Plasma Glucose:** ≥7.0 and <11.1 mmol/L (140 and 200 mg/dl)
IFG[2]	- **Fasting Plasma Glucose:** 6.1 to 6.9 mmol/L (110 mg/dl to 125 mg/dl) AND **(**if measured) - **2-h Plasma Glucose:** ≥11.1 mmol/L (200 mg/dl)
Diabetes	- **Fasting Plasma Glucose:** ≥7.0 mmol/L (126 mg/dl) OR - **2-h Plasma Glucose:** ≥11.1 mmol/L (200 mg/dl) OR - **HbA1c:** ≥ 6.5% In the absence of unequivocal hyperglycemia, diagnosis requires two abnormal test results from the same sample or in two separate test samples. (2 FPG / 2 A1C / FPG and A1C/ FPG and 2hpp)
Prediabetes	- **Fasting Plasma Glucose:** 5.6 – 6.9 mmol/L (100 - 125 mg/dL) - **2-h Plasma Glucose:** 140- 199 mg/dl (7.8-11 mmol/L) **- HbA1C:** 5.7 – 6.4% The person is at risk to develop diabetes mellitus.
GDM[3]	- **Fasting Plasma Glucose:** 5.1 - 6.9 mmol/L (92 - 125 mg/dl) - **1-h Plasma Glucose:** ≥ 10.0 mmol/L (180 mg/dl) - **2-h Plasma Glucose:** 8.5 - 11 mmol/L (153 - 199 mg/dl)

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Diagnosis in asymptomatic adults

- Testing should be considered in **overweight** or **obese** adults who have **one or more of the following risk factors:**
  - First-degree relative with diabetes.
  - History of CVD or Hypertension.
  - Women with polycystic ovary syndrome.
  - Physical inactivity.
  - Conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans)
- Patients with prediabetes should be tested yearly.
- Women who were diagnosed with GDM
- For all other patients, testing should begin at age 45 years.
- If results are normal, testing should be repeated at a minimum of 3-year intervals.

Common diabetes complications

- Cardiovascular events **(Cardiovascular disease)(CVD):** Adults with diabetes historically have 2-3 times higher rate of cardiovascular disease (CVD) than adults without diabetes.
- **End stage renal disease (CKD):** The incidence of ESRD is up to 10 times as high in adults with diabetes as those without.
- **Neuropathy:** Screening by the GP no need for referral to neurology: All patients should be assessed for diabetic peripheral neuropathy starting at diagnosis of type 2 diabetes and 5 years after the diagnosis of type 1 diabetes and at least annually thereafter.
- **Loss of vision:** Adults with type 1 diabetes should be referred to an ophthalmologist within 5 years after the onset of diabetes.
- **Lower extremity amputation**

Prevention of Type 2 diabetes

- **Modifiable factors:** Being overweight or obese, Unhealthy diet, Insufficient physical activity and Smoking
- **Not modifiable factors:** Genetics, Ethnicity and Age

Population-based prevention

(For more details refer to the lecture)

- **A life course approach to preventing diabetes:** Taking a life-course perspective is essential for type 2 diabetes prevention.
- **Improving early childhood nutrition:** Exclusive breastfeeding up to 6 months of age, Promoting the nutritional well-being of pregnant women ... etc (more details in the lecture)
- **Supportive environments for physical activity:** The physical or built environment plays an important role in facilitating physical activity for many people. (more details in the lecture)
- **Settings-based interventions:** A whole-of-school approach that focuses on improving both diet and physical activity, Healthy eating messages in cafés and restaurants have been shown to stimulate consumption of healthy food – provided that healthy food items are made available.
- **Fiscal, legislative and regulatory measures for healthy diet**
- **Education, social marketing and mobilization**
- **Preventing diabetes in people at high risk:** Intensive behavioral interventions for people with IGT and Pharmacological interventions for people with IGT

Prevention or delay development of diabetes

(For more details refer to the lecture)

- **Diabetes Prevention Program (DPP)**
- **Finnish Diabetes Prevention Study (DPS)**
- **Da Qing Diabetes Prevention Study (Da Qing study)**
- All demonstrated that lifestyle/ behavioral therapy featuring an individualized reduced calorie meal plan is highly effective in preventing type 2 diabetes and improving other cardiometabolic markers (such as blood pressure, lipids, and inflammation).

LIFESTYLE INTERVENTIONS:

- **Refer patients with prediabetes to an intensive behavioral lifestyle intervention program.**
- Based on the Diabetes Prevention Program (DPP) to achieve PREVENTION OR DELAY OF TYPE 2 DIABETES and maintain 7 - 10% loss of initial body weight and increase **moderate-intensity physical activity (such as brisk walking) to at least 150 min/week**

- **Health nutrition OSCE:**
- **Encourage** Minimize; refined and processed foods, like rice, white bread, sugary drinks, ...
- **A referral to dietitian**

- **Physical activity and tobacco cessation OSCE:**
- Just as 150 min/week of moderate intensity physical activity, such as brisk walking, showed beneficial effects in those with prediabetes.

- **Pharmacological interventions:**
- Metformin therapy for prevention of type 2 diabetes should be considered in those with prediabetes, especially for those who are obese and hypertensive.
- **Metformin and intensive lifestyle modification led to an equivalent 50% reduction in diabetes risk.**

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The National Executive Plan (438)

1. **The primary prevention** from the second type of diabetes, and diminishing incidence rates of the disease through addressing the risk factors causing the disease.
2. **Secondary prevention** from the second type of diabetes through the early detection of the disease and its complications.
3. **Advancing quality** of the health services delivered to the patients suffering from diabetes and its complications.
4. **Detecting and following up**, and assessing patients through Diabetics' Registration Program, extent of adherence to the work quality levels, annual follow-up registers, patients' interviews, and healthcare registers of patients.
5. Improving on the **research tools and studies** related to the disease.
6. Enabling diabetics and their families to **contribute** to controlling diabetes and its complications.
7. **Community participation** in controlling diabetes.

Saudi Efforts in preventing and controlling diabetes

There are multiple sectors serving people with diabetes in Saudi Arabia both in the private and public sectors at primary, secondary, and third level preventions. Examples:

- Saudi Charitable Association of Diabetes.
- The Ministry of Health.
- National Guard Health Affairs.
- The Saudi Society of Endocrinology and Metabolism [under the umbrella of the Saudi Commission for Health Specialties.]

The National Preventive program's goals:

- Suggest research pertaining to diabetes.
- Work on creating a national registry for diabetes in Saudi Arabia.
- Suggest collaborations and coordination efforts on a local level, Gulf region level and international level to achieve set goals.
- Suggesting preventive and curative diabetes programs, as well as overlook their execution and development.
- Create sub-committees to follow up on created programs.
- Study reports form sub-committees, finalize them, and develop recommendations.
- Take decisions and develop recommendation in issues raised to the program.

Global efforts

The WHO had nations sign:
GLOBAL ACTION PLAN FOR THE PREVENTION AND CONTROL OF NONCOMMUNICABLE DISEASES 2013-2020

From the goals

- Halt the rise in diabetes and obesity.
- A 25% relative reduction in the overall mortality from cardiovascular diseases, cancer, diabetes, or chronic respiratory diseases.

Sustainable development goals by the UN

- The Sustainable Development Goals (SDGs):
- A collection of 17 global goals set by the United Nations.
- The third goal is : Good health and well being.

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Wish you all
the best!