Epidemiology of diabetes mellitus (DM)

Definition of DM:

- A metabolic disorder of multiple aetiology characterized by chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action or both.
- Associated with a risk of developing late diabetic complications including
  - Microvascular (retinopathy, nephropathy, Neuropathy).
  - Macrovascular (atherosclerosis)
  - Foot ulcers

Epidemiological characteristics

- It affects all ethnic and socioeconomic groups
- Incidence and prevalence highly varied between and within countries 20-60 folds difference
- DM is an important cause of premature death and causes serious health consequences
- It is important risk factor of CHD
- CHD is the leading cause of death among diabetics

Diabetes is a Worldwide Epidemic

	2011	2030
Total world population (billions)	7.0	8.3
Adult population (20–79 years, billions)	4.4	5.6
Diabetes		
Global prevalence (%)	8.3	9.9
Number of people with diabetes (millions)	366	552

International Diabetes Federation. IDF Diabetes Atlas. Update 2012.
International Diabetes Federation. Global burden. IDF Diabetes Atlas. 5th edition 2011.

In Iraq (2006): the prevalence of DM was 4.1%.

Basrah (2007): the prevalence of DM was 7.4%
Unrecognized (2.1%) & recognized DM (5.3%)

Causes of DM epidemic

a. Aging of population
b. Cultural and socio-economic changes [Urbanization]
c. Lifestyle changes

Economic Burden

It is estimated that the cost of caring for people with diabetes is 2-4 times the cost of caring for non-diabetic people in most health care systems. The total costs of DM in USA in 2003 were at $132 billion.

Types of DM

1. Type 1 DM

- Accounts for 10% of all patients
- Destruction of B-cells
- Absolute insulin deficiency
- Mostly at ages <30 years (it can occur at any age)

Type 1 DM is subclassified into:

A- Autoimmune:

- Presence of autoimmune markers (ICAs, IAAs, Autoantibodies to GAD65)
- Strong HLA association
- There is a genetic element

B- Idiopathic: (no known cause)

- Only minority of patients fall in this group
- Occurs in individuals of African& Asian origin
- Strongly inherited
- Lacks autoimmune markers
- No HLA associated

2. Type 2 DM

- Most common (90%)
- After age of 40 years
- Predominant insulin resistance with relative insulin deficiency, ultimately loss of B-cells mass can lead to insulin dependency
- Onset is insidious
- Due to genetic factors, environmental factors or both

3. Other specific types:

- Genetic defects in Beta cells: onset at early age (<25 years). It is inherited as an autosomal dominant pattern. Previously known as maturity onset diabetes of young (MODY)
- Genetic defect in insulin action
- Diseases of pancreas
- Endocrinopathies
- Drugs

4. Gestational diabetes

Impaired Glucose Tolerance

Impaired glucose tolerance was defined by the Expert Committee as:

- Fasting plasma glucose of 110-125 mg/dl
- 2-hour post glucose load 140-199 mg/dl

Risk factors of DM

1. *Genetic factors*

- Twin studies demonstrate:
  a. A very strong genetic component to the etiology of type 1 DM.
  b. > 30% concordance among monozygotic twins pairs in the expression of type 2 DM.
- Certain racial groups, as African Americans, Hispanics, and Americans Indian origin, are at increased risk for type 2 diabetes.

2. *Age:* Incidence of type 2 DM increases with increasing age.
3. *Obesity:* Incidence of type 2 DM increases with increasing body mass index. Obesity can induce *resistance to the action of insulin.*
4. *Physical inactivity:* Lack of exercise may *alter the interaction* between insulin and its receptors and subsequently leads to type 2 D.M.
Vigorous exercise ≥ 1/week leads to 25% risk reduction
5. *Drugs & hormones:* Long list of drugs that affect carbohydrate metabolism had been identified. e.g. Phenytoin, diuretics (thiazide type), corticosteroids, oral contraceptives, and Beta-adrenergic blocking agents.
6. *Pancreatic disorders:* Inflammatory, neoplastic, and other disorders of the pancreas e.g. cystic fibrosis, and pancreatectomy.
7. History of gestational diabetes or delivery of large babies.

Prevention of type 1 DM

- It should be done before the onset of pathological process i.e. before development of immunological markers
- It is still EXPERIMENTAL
- Because of the very low prevalence, it required screening test of high specificity and sensitivity, inexpensive and easy to perform

The screening includes:

- Family history
- Genetic markers (HLA)
- Immunological risk markers (ICA, IAA, Anti GAD)
- Metabolic risk factors

- Screening is costly and technically difficult
- Those who have these factors have 10 folds excess risk
- Still 95-97% of them do not develop the disease later

Primary Prevention Strategy of type 1 DM

- Deprivation of caw milk protein in the neonatal and early infancy
- Administration of free radical scavenger, as Nicotinamide
- Allowing B-cell rest by administration of early insulin treatment
- Encouraging the development of Antigen tolerance by administration of early insulin treatment or oral antigens
- Immunosuppression or Immunomodulation

Preventive measures of type 2 DM

1- Primary prevention: Primary prevention of type 2 DM can be achieved by:
- Promotion of healthy nutrition: Encourage low saturated fat, high fiber diet.
- Smoking cessation
- Increase Physical activity
- Correction of obesity: Encourage weight loss to keep BMI<30

There are two approaches:

- The high risk approach:

This is directed at high-risk people such as those with family history of type 2 DM, obese individuals, and those with previous abnormalities of glucose tolerance including gestational diabetes.

- The population approach:

This is based on altering the environmental risk factors and determinants of type 2 in the whole population through public education

2- Secondary prevention: This level of prevention aims at early detection of asymptomatic cases

- Early detection and treatment
- Screening for gestational diabetes
- Screening for susceptible groups

Screening for diabetes:

- Screening all adults over 40 years of age with fasting plasma glucose every 2-3 years.
- Begin screening at earlier age with a positive family history, obesity, or symptoms of DM.

3-Tertiary prevention: This involves treatment of already established cases of diabetes

Patient and family counseling

Patients and their families should be aware of the following:

- The disease is permanent, life-long treatment is required
- Control of blood sugar to delay appearance of microvascular complications
- Importance of foot care
  - Wash & dry feet daily
  - Soften & gently reduce calluses
  - File (but not cut) nails
  - Wear shoes that are soft and well fitting
  - Never walk barefoot
  - Notice & deal with small injuries or signs of pressure

Classic elements in the public health response to diabetes