25th lecture:

Epidemiology of DM

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This lecture is based on the males' slides and females' notes

Definition:

- It's an endocrine disease with 3 types type1, 2 and gestational diabetes. However, it's classified now as type 1 and 2 which are insulin dependent and non insulin dependent.
- There are many etiological factors that contribute to the development of this disease such as:
- Obesity, diet, genetic, viral infection... etc.

    – 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.

    – Either the pancreas doesn't produce insulin, or there's peripheral resistance.

    – Associated with a risk of developing late diabetic complications including

        - Microvascular (retinopathy, nephropathy)

        - Macrovascular (atherosclerosis)

        - Neuropathy

Types of diabetes

- **Type 1 (5-10%)** insulin dependent

– Sudden onset absolute deficiency in insulin. Usually affects younger age group (not always)

- **Type 2 (90 - 95%)** non-insulin dependent

- Gradual onset of relative insulin insensitivity. Usually older age group (not always) nowadays it's seen in younger patient

- **Pre-diabetes – T2DM**

- Impaired glucose tolerance not diabetics but they need to be controlled and maintained.
- Diabetics may remain undiagnosed for years; risk of complications same as for T2DM

Diagnosis of diabetes

Symptoms:

- Thirst
- Passing lots of urine polyurea
- Malaise
- Infections (oral thrush)
- Weight loss

BUT – many years of pre-diabetes (type 2) before these symptoms appear!

Biochemical tests

- Random plasma glucose
- Fasting plasma glucose
- Oral glucose tolerance test – 2h glucose
  - WHO criteria
  - ADA criteria

Diagnosis:

- A **symptomatic** patient plus **casual plasma glucose ≥ 11.1** mmol/L or **FPG ≥ 7.0** mmol/L.
  - During an **OGTT 2-hr post 75 gm-glucose ≥ 11.1** mmol/L.
- In **the absence of symptoms** suggestive of DM, these criteria should be confirmed by repeat testing on a different day.
  - FPG ≤ 5.5 mmol/L = normal
  - FPG ≥ 5.6 mmol/L to 6.9 mmol/L= IFG (impaired fasting glucose)
  - FPG ≥ 7.0 mmol/L = provisional diagnosis of DM and must be confirmed in asymptomatic person.

Diagnosis based on: Glucose Tolerance Test: 2 hr post 75 gm glucose

- If < 7.8 mmol/L = normal GTT
- If ≥ 7.8 mmol/L and < 11.1 mmol/L =   Impaired GTT
- If ≥ 11.1 mmol/L = provisional diagnosis of Diabetes

Epidemiology of diabetes

- Prevalence worldwide is increasing*

  - 2.8% in 2000; 4.4% in 2030 worldwide.
  - 171 million in 2000; 366 million in 2030.
  - Greatest rise in developing world

*Wild S et al; Diabetes Care, May 2004. Vol 24, pg 1047-53

Global Projections for the Diabetes Epidemic: 2000-2030 (in millions)
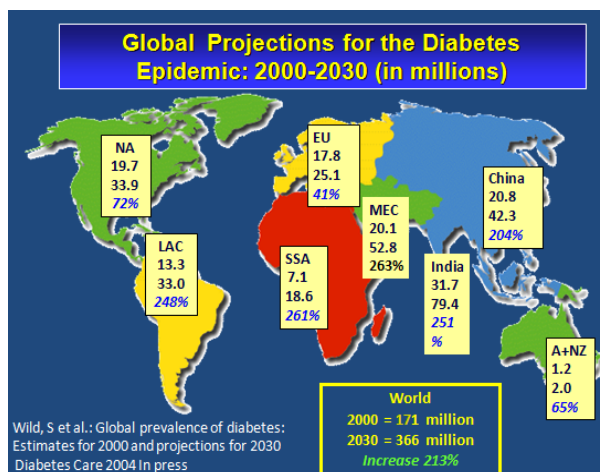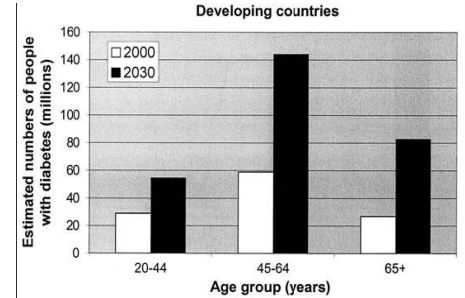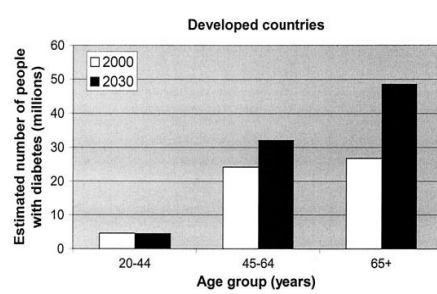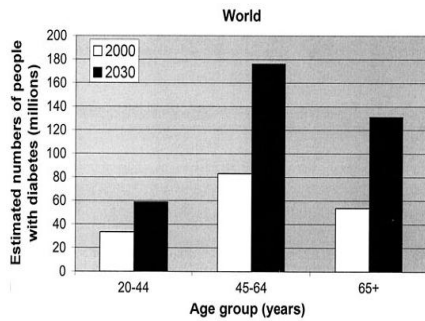
In 200:

#1 is India

#2 china

#3 United states
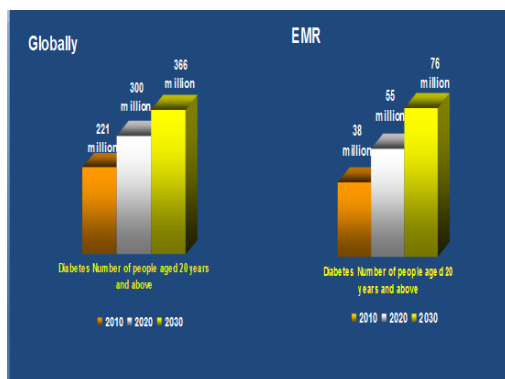
- The probability of developing diabetes will increase.

Table 2.1. Top 10 countries/territories for prevalence* (%) of diabetes (20-79 years), 2011 and 2030

	COUNTRY /TERRITORY	2011 PREVALENCE (%)		COUNTRY /TERRITORY	2030 PREVALENCE (%)
1	Kiribati	25.7	1	Kiribati	26.3
2	Marshall Islands	22.2	2	Marshall Islands	23.0
3	Kuwait	21.1	3	Kuwait	21.2
4	Nauru	20.7	4	Tuvalu	20.8
5	Lebanon	20.2	5	Nauru	20.7
6	Qatar	20.2	6	Saudi Arabia	20.6
7	Saudi Arabia	20.0	7	Lebanon	20.4
8	Bahrain	19.9	8	Qatar	20.4
9	Tuvalu	19.5	9	Bahrain	20.2
10	United Arab Emirates	19.2	10	United Arab Emirates	19.8

*comparative prevalence

- The incidence of diabetes is massively increasing

Prevalence of diabetes based on stepwise surveys:

- Jordan: 12%
- Iraq: 10.4%
- Syria: 20.5%
- Saudi Arabia: 17.9%
- Iran: 10.3%
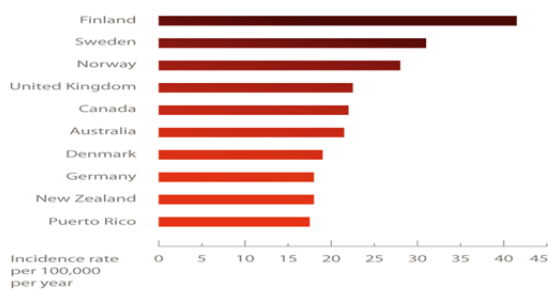- No available data from other EM countries
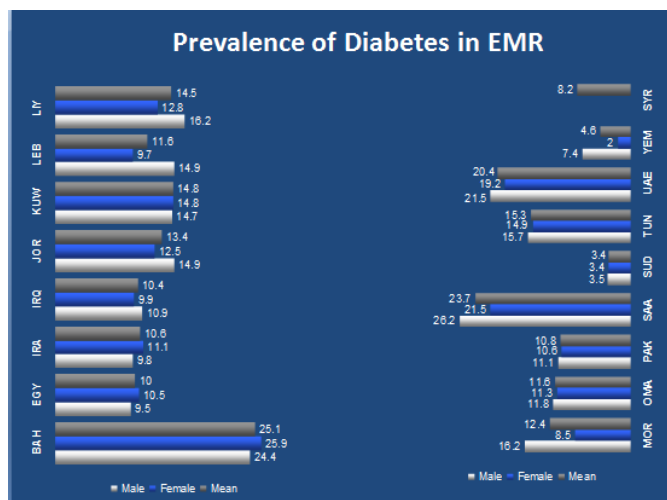
Type 1 diabetes epidemiology

- Very big variation in incidence and prevalence
- Variation in growth-rate
- Disease process relatively well described
- Genetic markers known
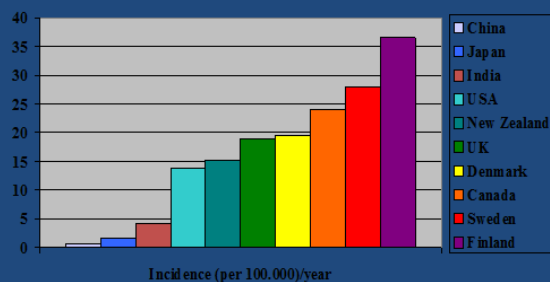- Weak risk factors

FIGURE 2.3
Top 10 countries: incidence rate for type 1 diabetes in children (0-14 years)

Only countries where studies have been carried out in that country have been included

Source: *Diabetes Atlas* 3rd Ed., © International Diabetes Federation, 2006
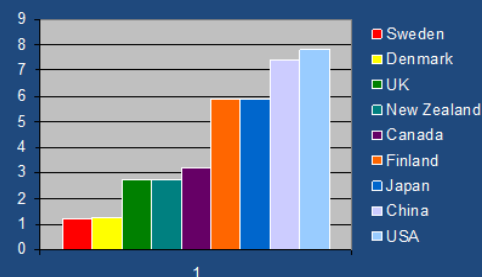

Incidence of type 1 diabetes Age 0-14 years

IDF Diabetes Atlas 2003

incidence geographically variation between continents and within continents.
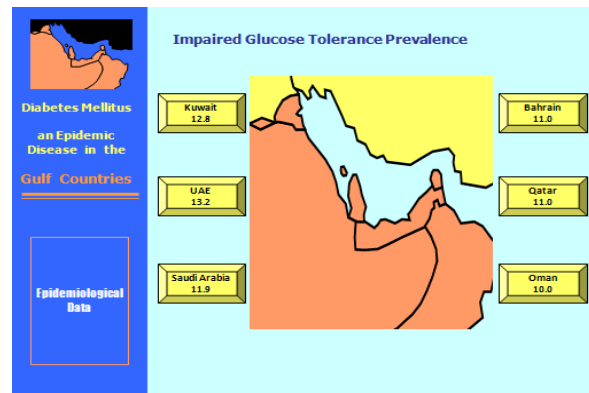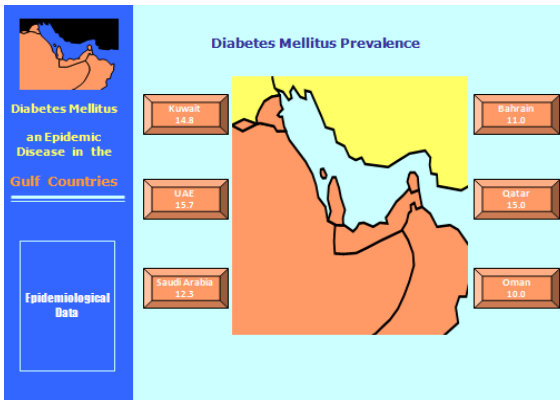
The highest incidence in the developed countries.

Type 1 diabetes Increase in incidence/year

The Global burden of diabetes

- Diabetes accounts for more than 5% of the global deaths, which are **mostly due to CVD**.

- Diabetes is responsible for over one third of end-stage renal disease requiring dialysis.

- Amputations are **at least 10 times more common in people with diabetes.**

- A leading cause of blindness and visual impairment. Diabetics are **20 times more likely to develop blindness** than nondiabetics.
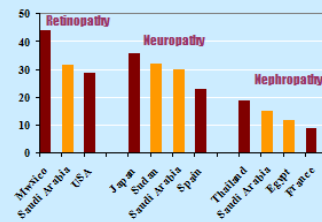

The complications are increasing!
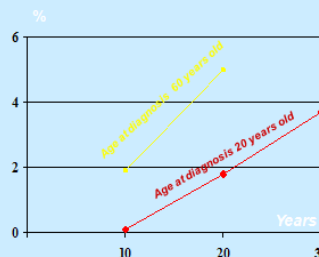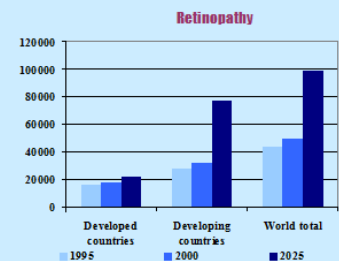
Diabetes Complications in the Gulf Countries

Prevalence of Retinopathy in Saudi diabetic patients

31.5%

IDDM 42.5%
NIDDM 25.3%

Risk factors for Retinopathy in Saudi diabetic patients

☆ Duration > 10 years.
🕐 Presence of nephropathy.
🕐 Older than 60 years.
🕐 Poor diabetes control.
🕐 Use of insulin.

Diabetes Complications in the Gulf Countries

Diabetes in the Gulf countries

Diabetes is the leading cause for	Blindness
Diabetes is the leading cause for	ESRF
Diabetes is the leading cause for	IHD
Diabetes is the leading cause for	CVA
Diabetes is the leading cause for	Amputation

Risk factors:

- Risk factors for Type 2 DM are complex including obesity, genetic and life style factors (overfeeding and sedentary life). There is patho- physiological changes (weight gain insulin resistance and reduction of insulin secretion) may lead to glucose intolerance and diabetes

- **Obesity:** contributes to the resistance to endogenous insulin.

    – RR (relative risk) of DM in females (ref. BMI < 22)

        - 22-23   3.0

        - 24-25   5.0

        - > 31   40

(Colditz & al, Ann Int Med, 1995, 122; 481-6)

- **Physiologic or emotional stress:** causes prolonged elevation of stress hormone levels **(cortisol, epinephrine, glucagon and growth hormone)**, which raises blood glucose levels, placing increased demands on the pancreas.

Prevalence of Smoking according to STEPwise Survey in EM countries
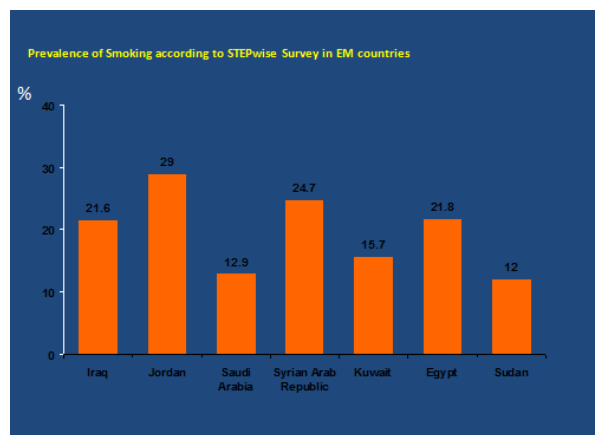
- **Exercise**

    – Vigorous exercise $\geq$ 1/week, 25% risk reduction

    – (Manson & al, Lancet 1991, 338; 774-8., JAMA, 1992, 268,63-7)

    – Looking TV 2-10 hours per week: RR 1.66 of having DM compared with 0-1 hour per week

(HU et al; Arch Intern Med 2001;161: 1542-1548)

- **Genetic factors** may play a part in development of all types; autoimmune disease and viral infections may be risk factors in Type I DM.

- **Pregnancy:** causes weight gain and increases levels of estrogen and placental hormones, which antagonize insulin.

- **Medications** that are known to antagonize the effects of insulin: thiazide diuretics, adrenal corticosteroids, oral contraceptives.

- **Infection or illness.** A range of relatively rare infections and illnesses can damage the pancreas and cause type 1 diabetes. e.g. **Mumps, CMV, EPV.**

Prevention:

- **Primary:** exercise, screening for high risk group, nutrition.
- **Secondary:** proper treatment of diabetic patients, early diagnosis by **screening of the high risk group. Otherwise it's primary.**
- **Tertiary:** rehabilitation.

References

- http://www.diabetesatlas.org/content/global-burden.
- Al-Madani A. Diabetes Complications in the Gulf Countries. Presentation.
- Ibtihal Fadhil. RA/ NCD/ Health promotion and Protection /EMRO/WHO Diabetes and Other Non-Communicable Diseases / EM Regional Perspective. First BA Regional Workshop on the Epidemiology of Diabetes and Other Non-Communicable Diseases , Bibliotheca Alexandrina. 5-13 January 2009.
- WILD S, ROGLIC G, GREEN A, SICREE R, KING R. Global Prevalence of Diabetes. Estimates for the year 2000 and projections for 2030. DIABETES CARE 2004; 27 (5):1047-53.