Community 432 Medicine

Epidemiology of Diabetes mellitus

Doctor's notes are in **green**.

Additional information are in **orange**.

Unmentioned information are in **grey**.

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Learning Objectives

- At the end of the presentation the participant will be able to :
  - Discuss the Global prevalence of diabetes
  - Discuss the state of diabetes in KSA.
  - Know risk factors of diabetes.
  - Discuss the magnitude of complications of diabetes.

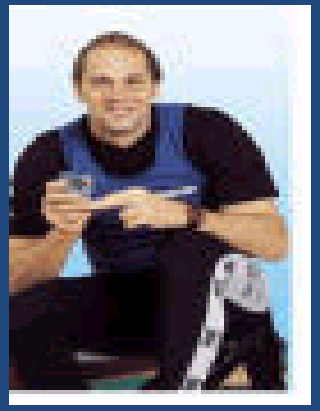
Diabetes Mellitus

Definition

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

Types of diabetes

- **Type 1** (5-10%) – **sudden onset** absolute **deficiency in insulin**. Usually affects younger age group (not always)



- **Type 2** (90 - 95%) – **gradual onset** of relative **insulin insensitivity**. Usually older age group (not always)

- **Gestational diabetes**

- **Secondary diabetes**

- **Pre-diabetes**

  Impaired glucose tolerance

  May remain undiagnosed for years; risk of complications same as for T2DM

Diagnosis of diabetes

Symptoms

- Thirst
- Passing lots of urine
- Malaise
- Infections (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

The two initial tests are: 1-Fasting blood glucose
2-HBA1C (every 6 months)

Fasting Blood sugar

- Non diabetic: FBS< 110 mg/dl (6.1m mol/dl).
- Glucose Intolerance: FBS 110 -125 mg/dl (6.1-6.9 m mol/dl).
- Diabetic: FBS >126 mg/dl (>7 m mol/dl)

  OR Random BS >200 mg/dl (>11.1m mol/dl) .

IMPORTANT!

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 = GTT
- If ≥ 11.1 mmol/L = provisional diagnosis of Diabetes

Why is diabetes so important?

The burden to patients, carers, NHS (NON HOSPITAL STAFF)

- **Complications**
  - **Cardiovascular eg: CHD**
  - **Eyes**
  - **Renal - Hypertension, renal failure**
  - **Feet >diabetic foot>amputations**
  - **Skin, infections, sexual, psycho-sexual, depression**
  - **Quality of life**
  - **Premature mortality**
- **Cost of disease and complications >> very high**

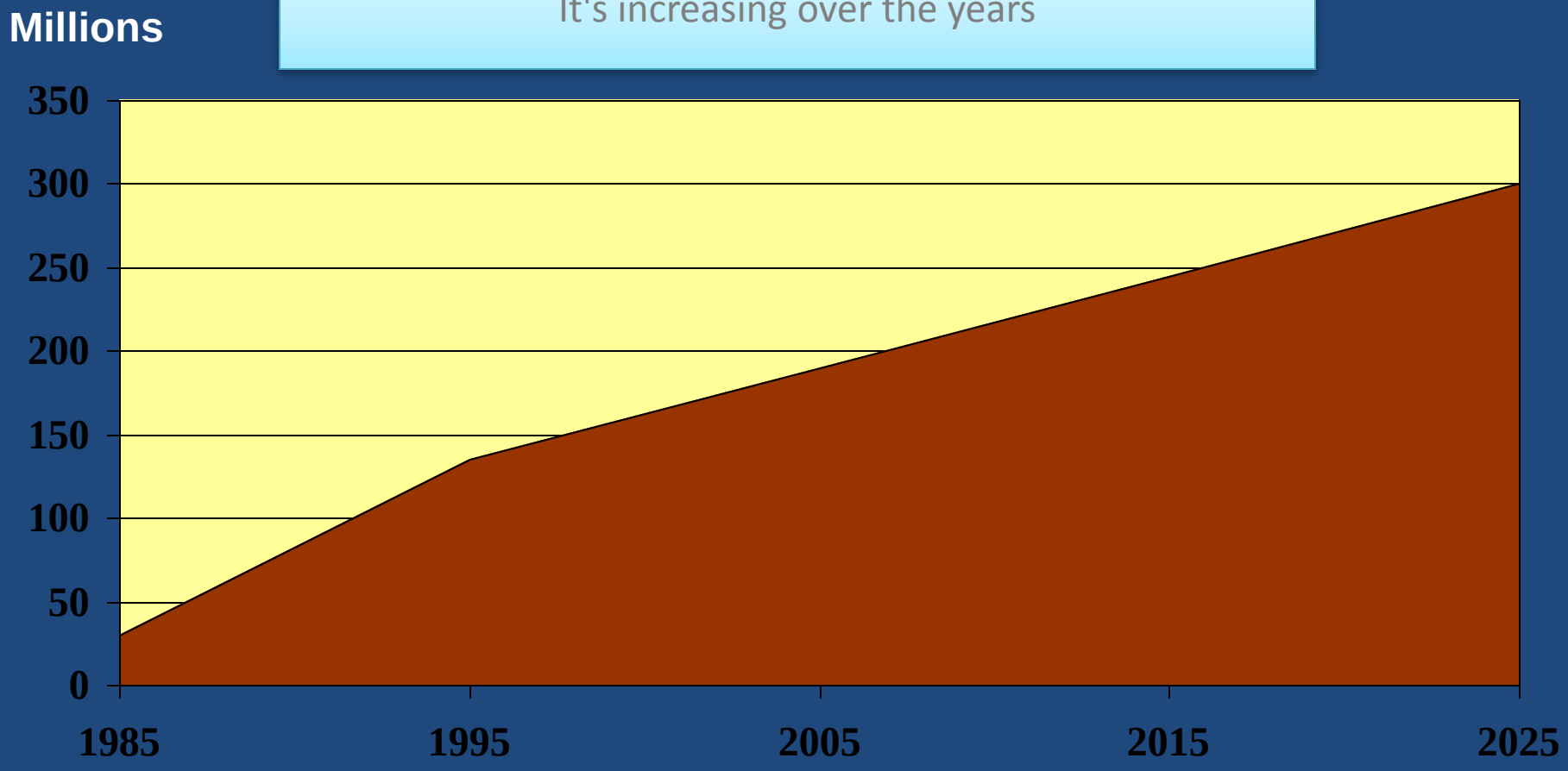
There are two types of complications:
1-Microvascular
2-Macrovascular

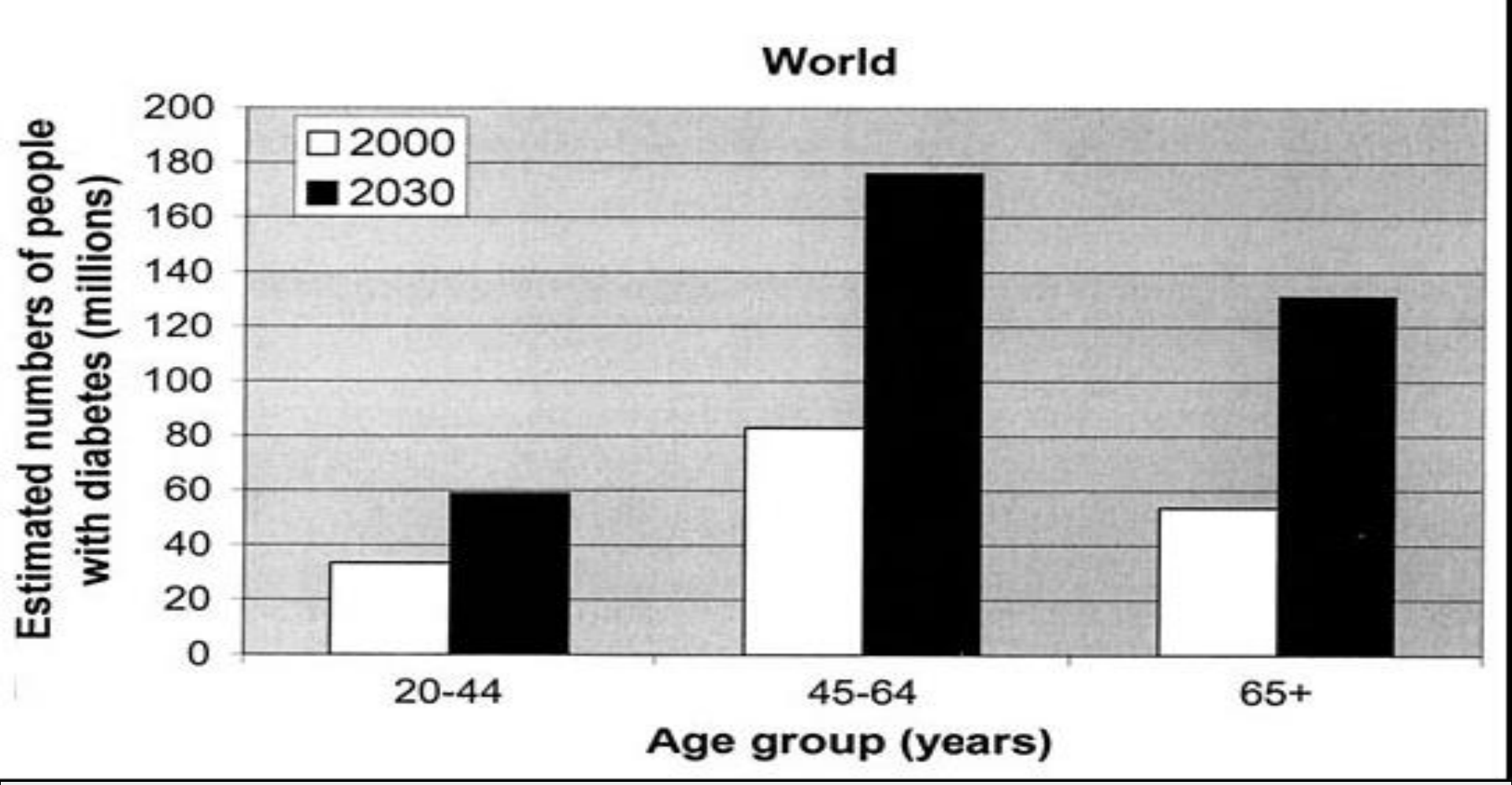
Epidemiology of diabetes

- Prevalence worldwide is increasing
  - 2.8% in 2000;
  - 4.4% in 2030 worldwide. (If we don't have an adequate control)
  - 171 million in 2000; 366 million in 2030
  - Greatest rise in developing world

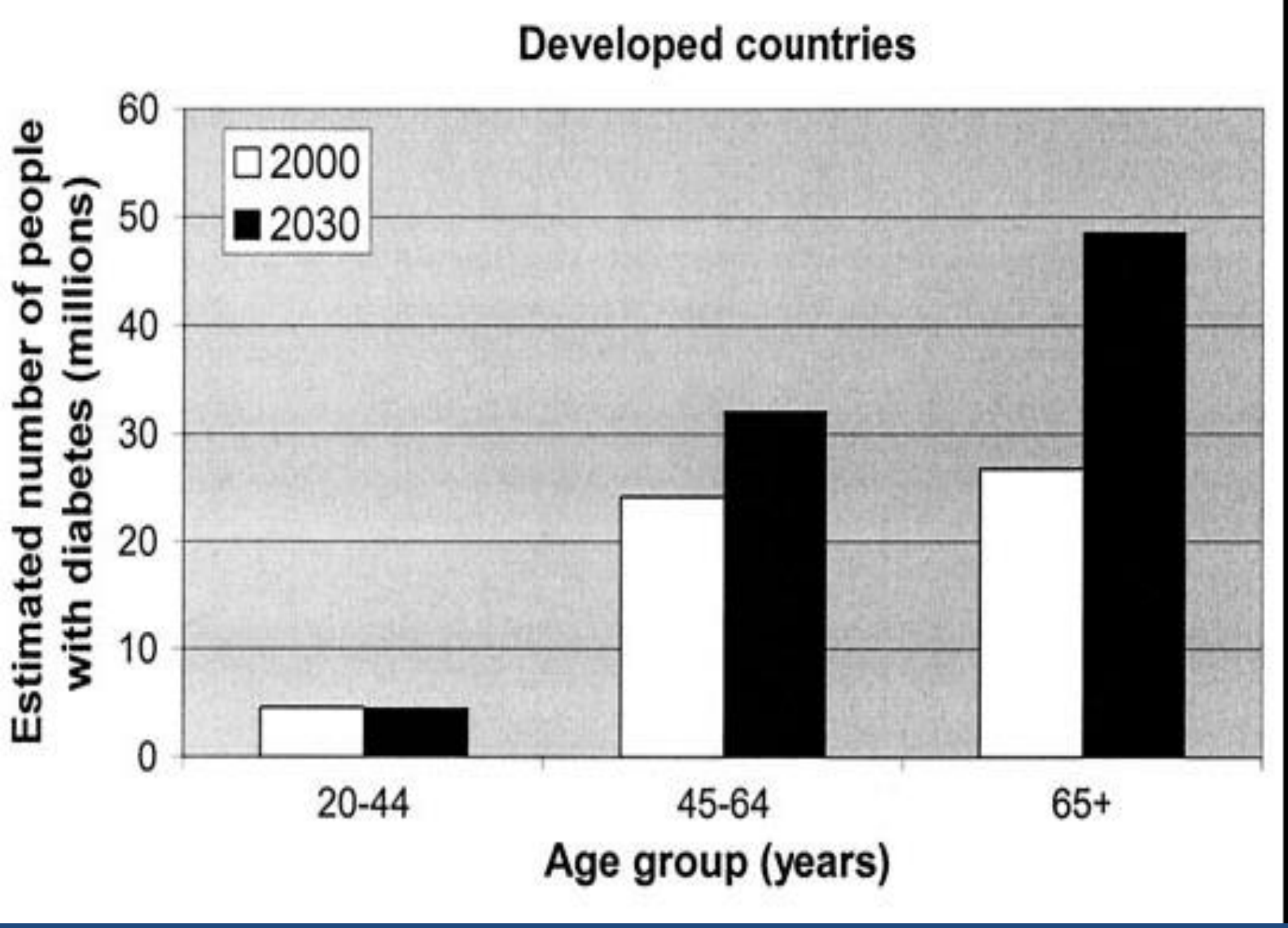
Diabetes in the world

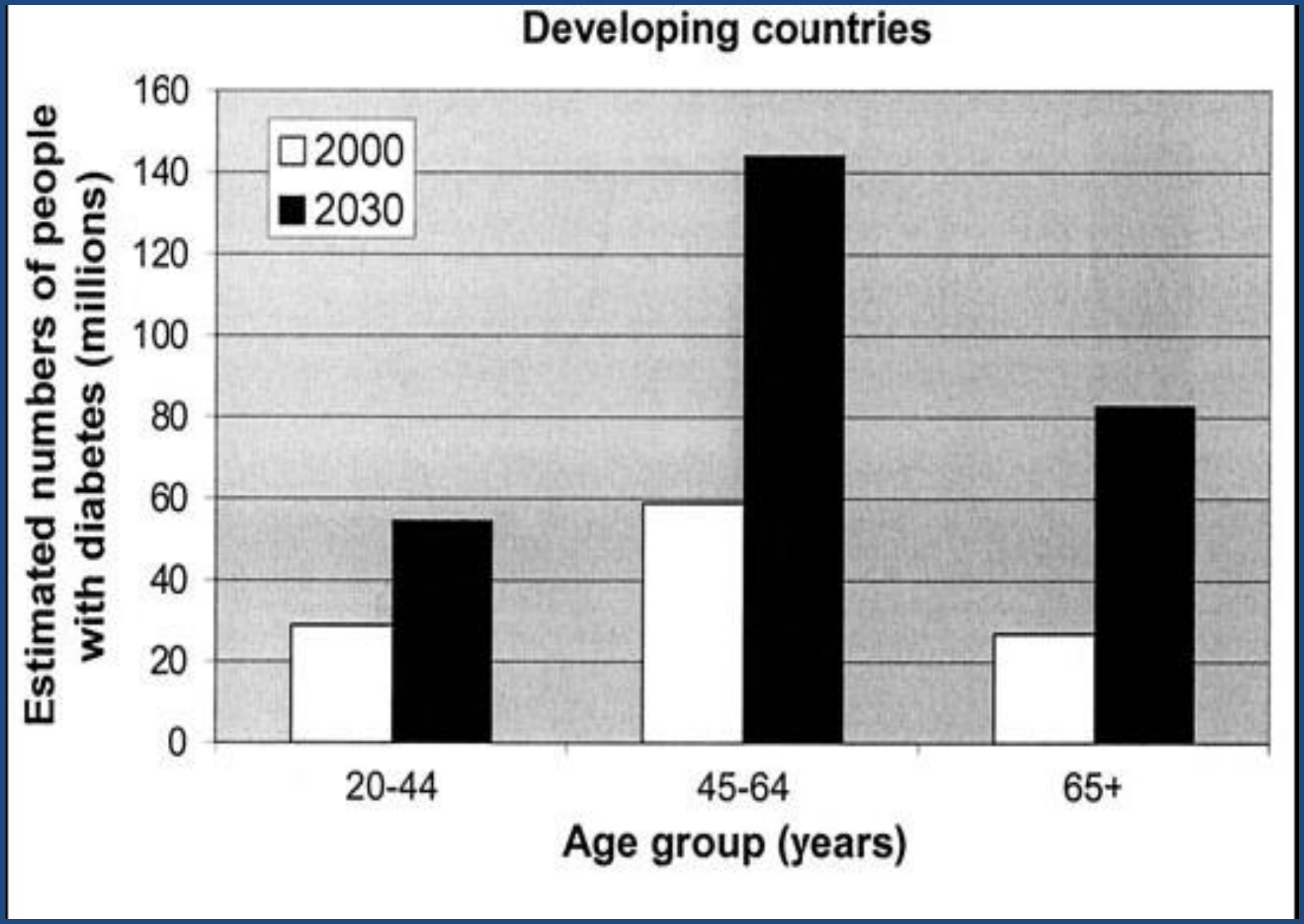
It's increasing over the years



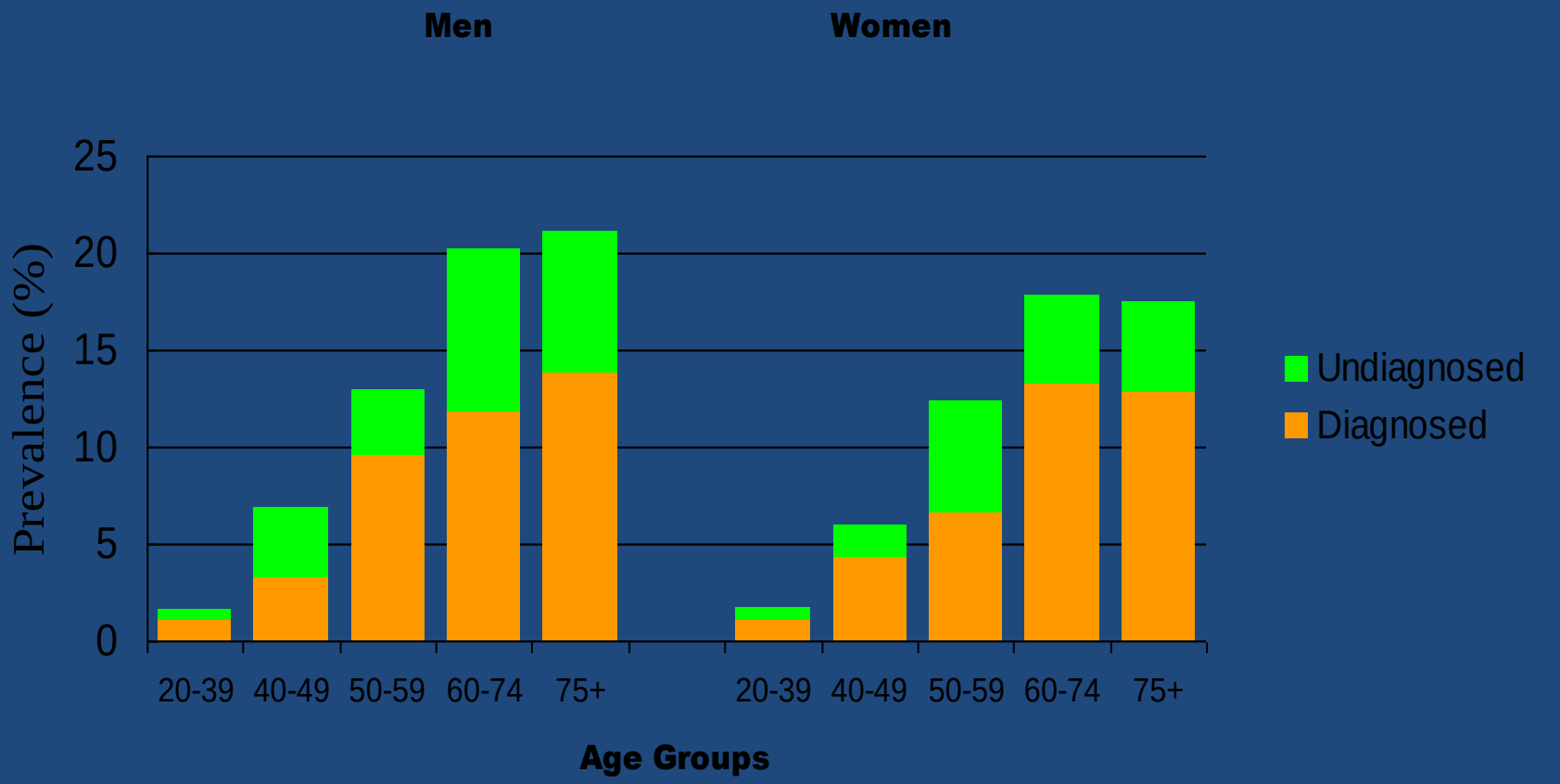


-Type 2 diabetes
-Prevalence (snap shot of the population at that point of time, not a trend)
-65+ will be huge by 2030
-It is more seen in developing countries


Developed countries
Estimated number of people with diabetes (millions)
60
50
40
30
20
10
0
2000
2030
20-44
45-64
65+
Age group (years)


Developing countries
Estimated numbers of people with diabetes (millions)
160
140
120
100
80
60
40
20
0
2000
2030
20-44
45-64
65+
Age group (years)

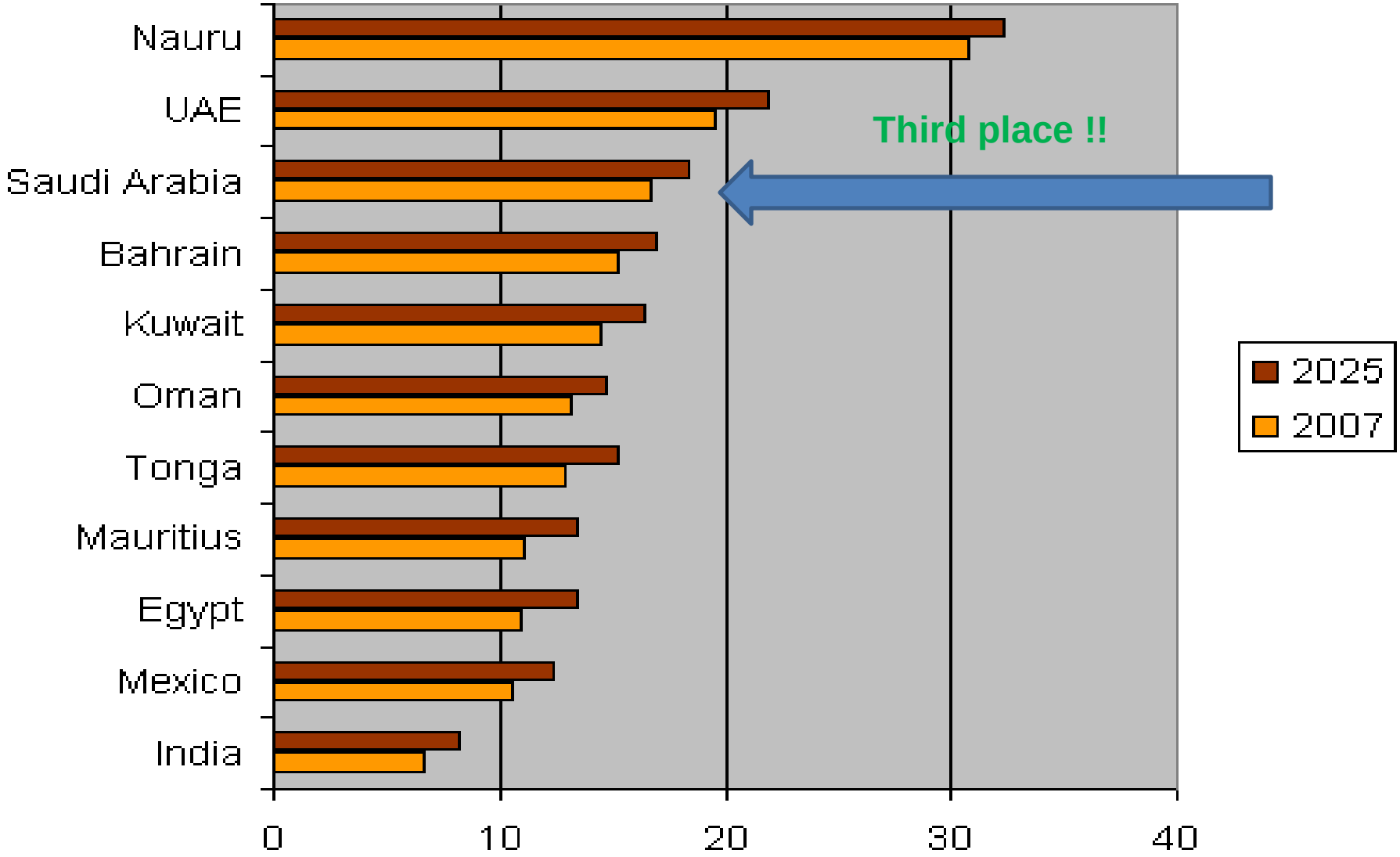
Diagnosed and Undiagnosed Prevalence of Diabetes by Age in the US (NHANES III)



The problems of the complications are caused by the undiagnosed groups

Top 10 Countries with the highest prevalence of diabetes in 2007 and 2025

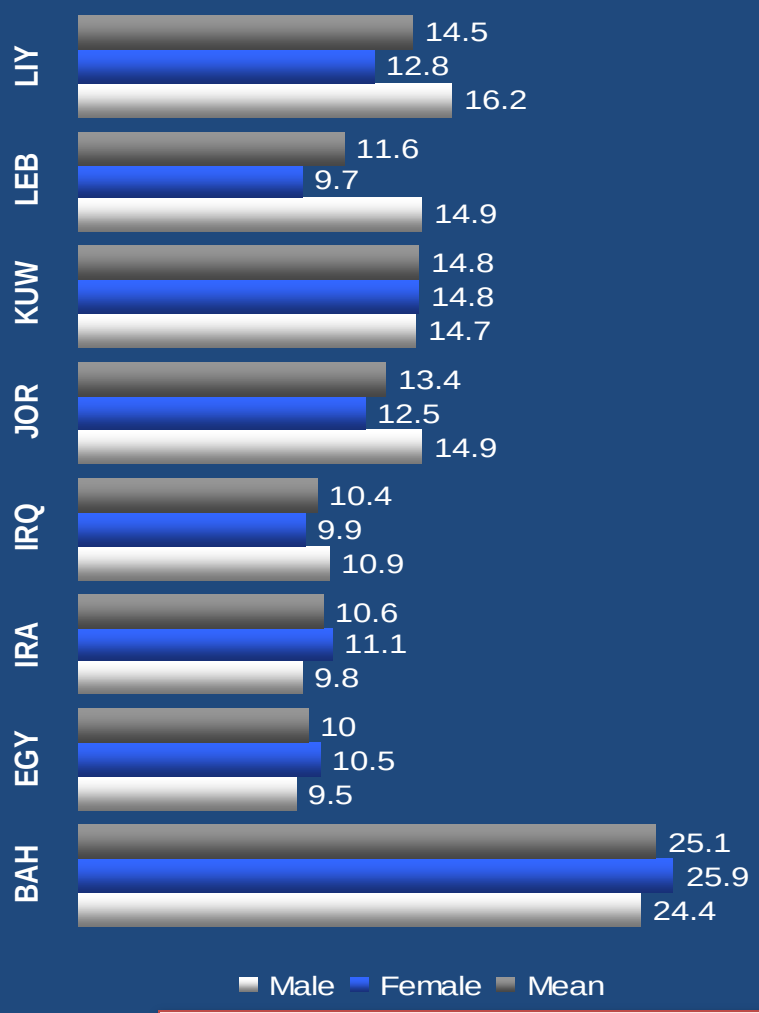
(SA figure is based on FPG of 7 mmol and over)

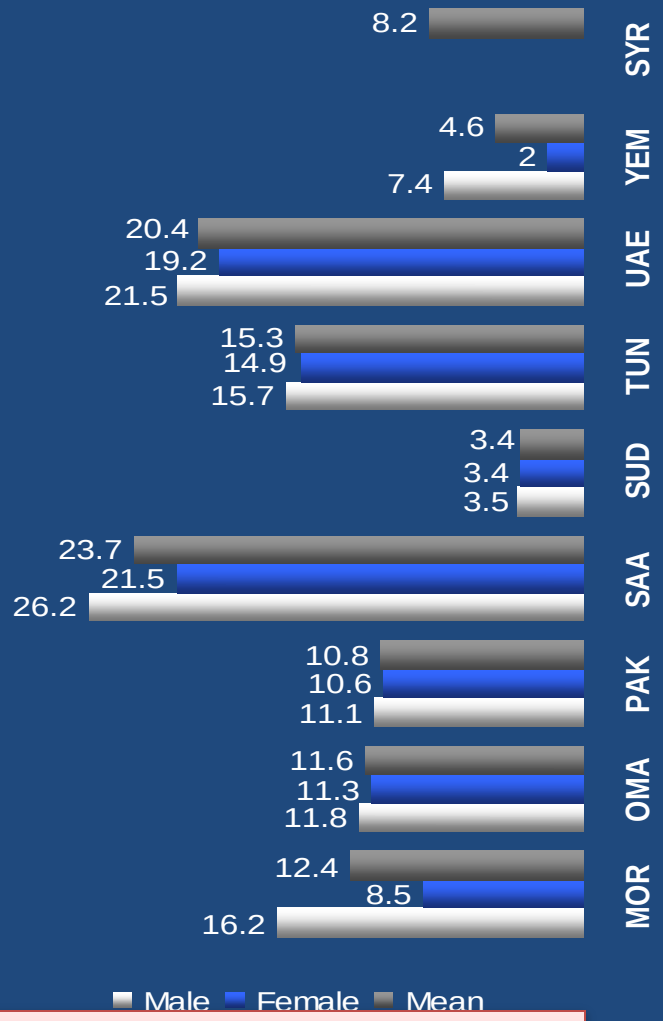


Prevalence of diabetes based on stepwise surveys

- Jordan: 12%
- Iraq: 10.4%
- Syria: 20.5%
- Saudi Arabia: 17.9%
- Iran: 10.3%

Prevalence of Diabetes in EMR





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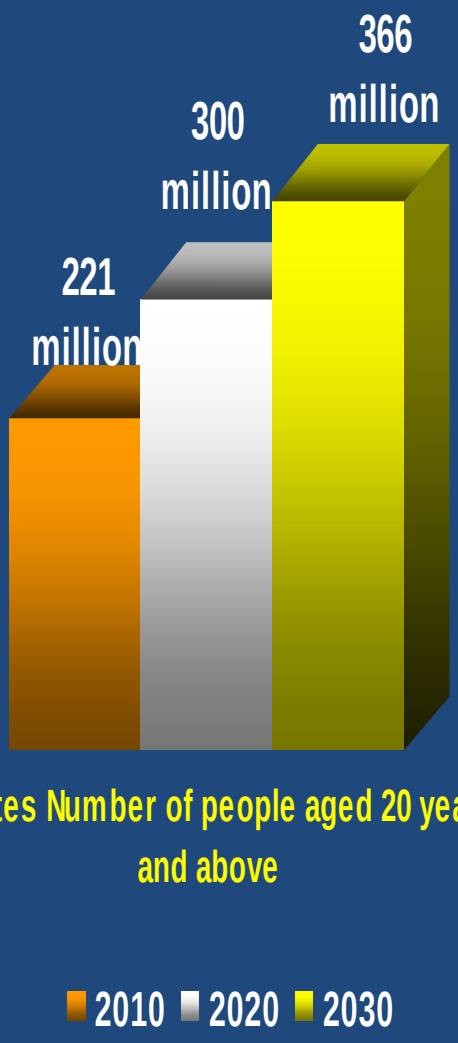
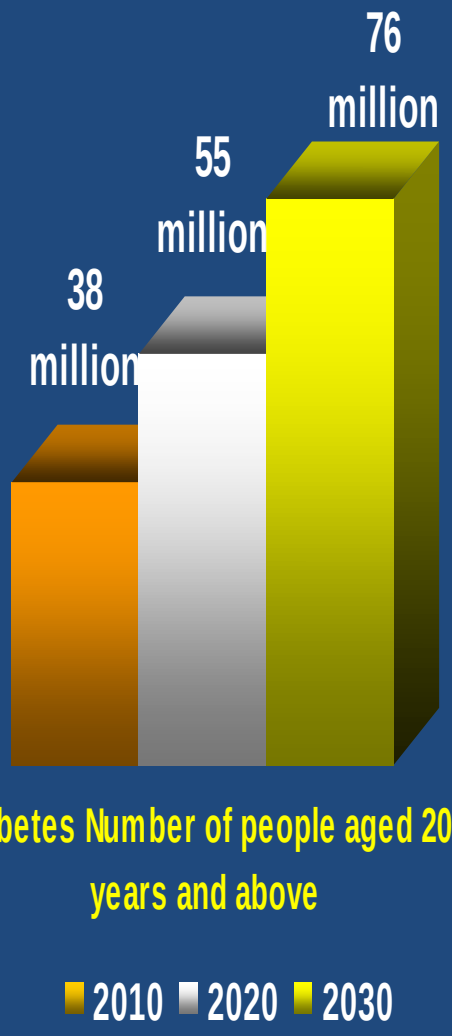
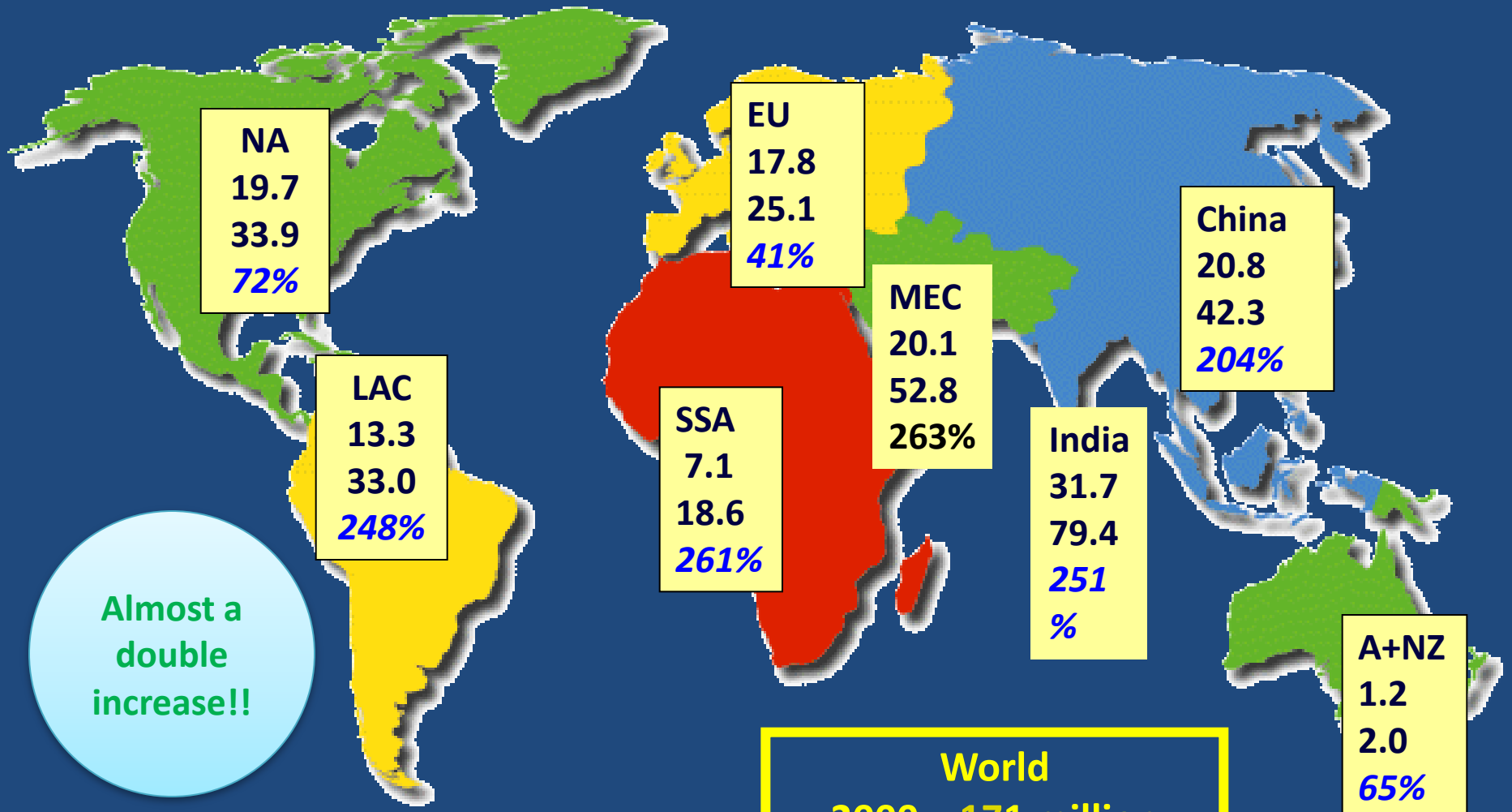
Globally



EMR



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

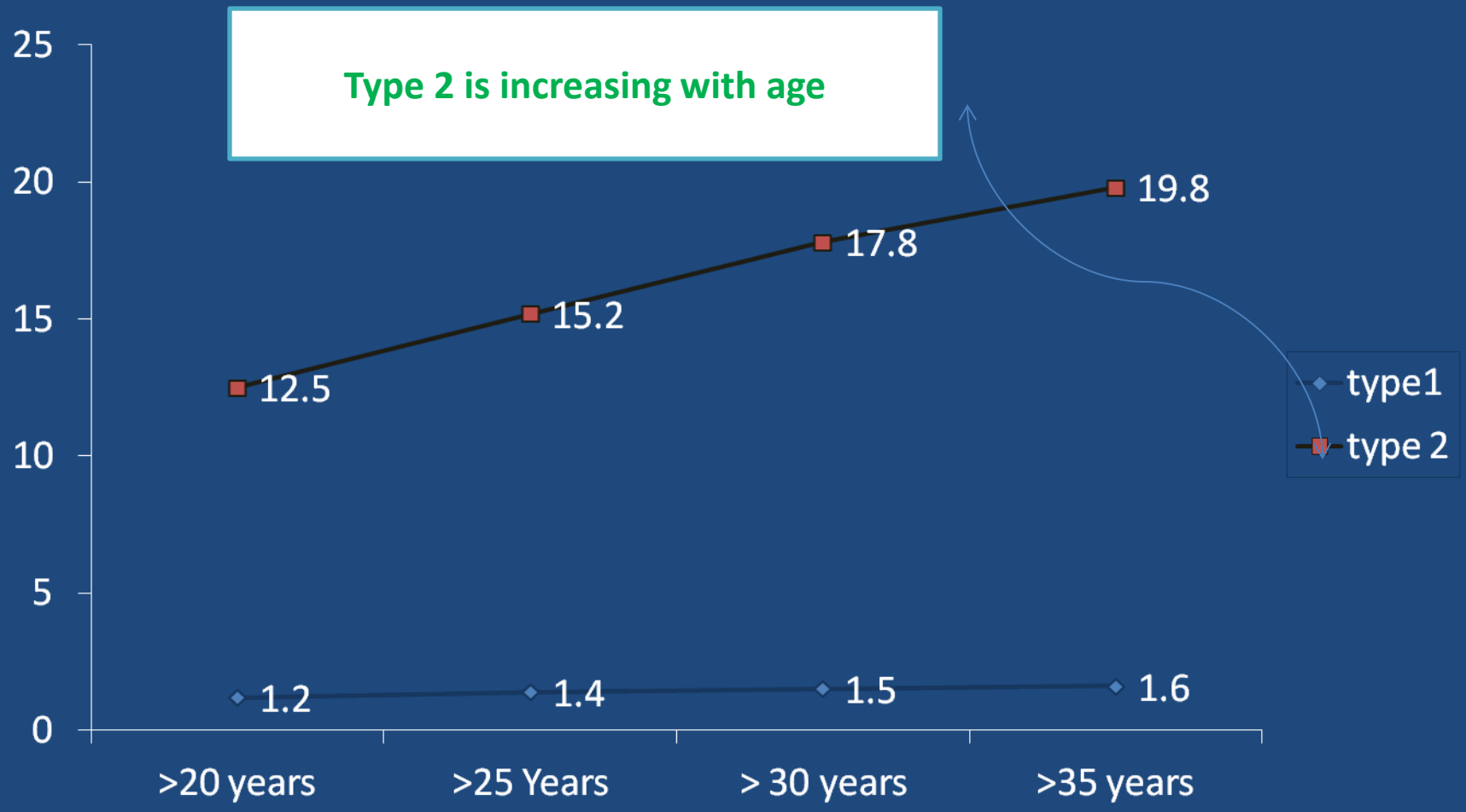


Almost a double increase!!

World
2000 = 171 million
2030 = 366 million
Increase 213%

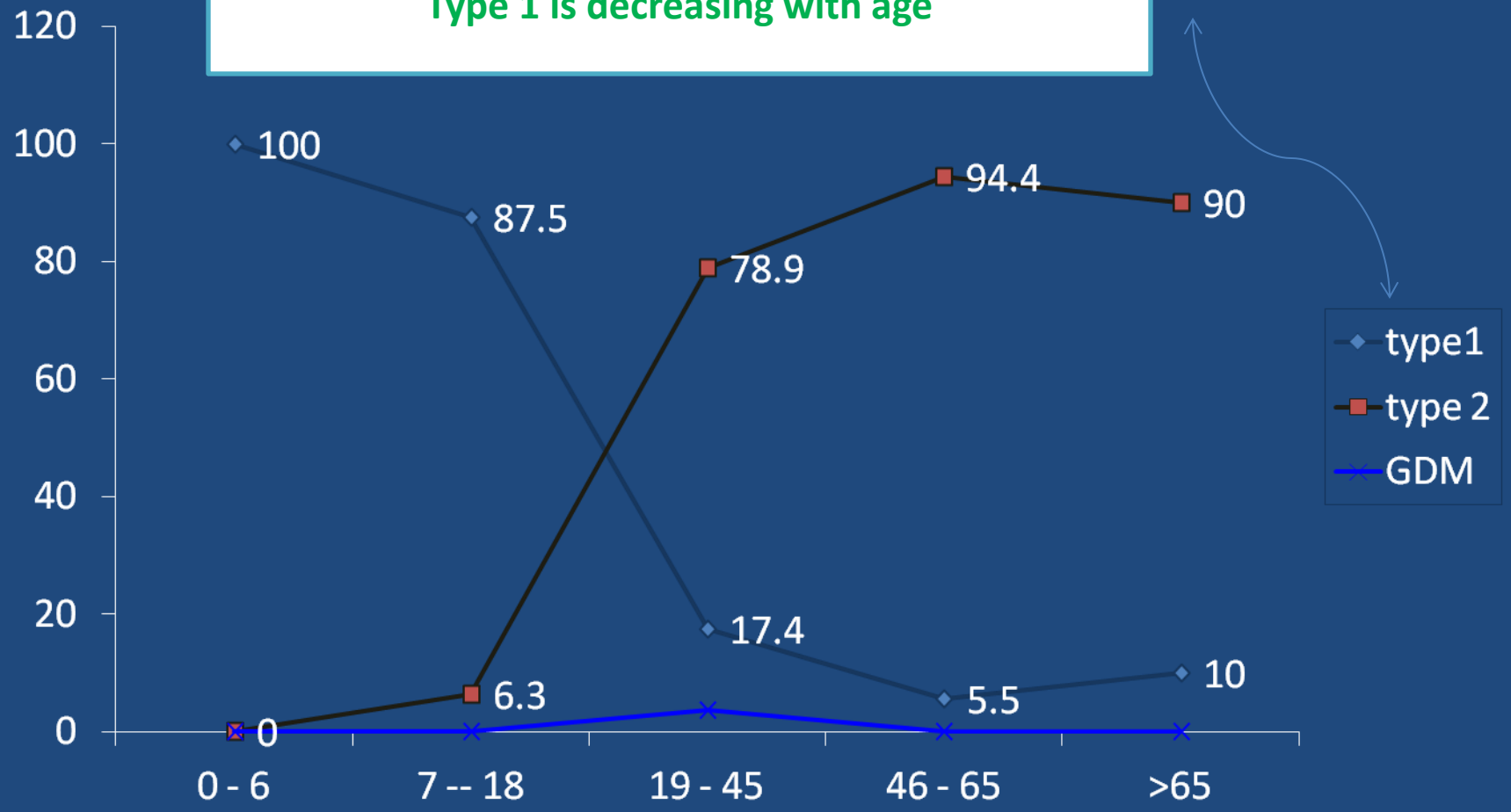
Wild, S et al.: Global prevalence of diabetes: Estimates for 2000 and projections for 2030 Diabetes Care 2004 In press

Diabetes mellitus and age distribution in KSA

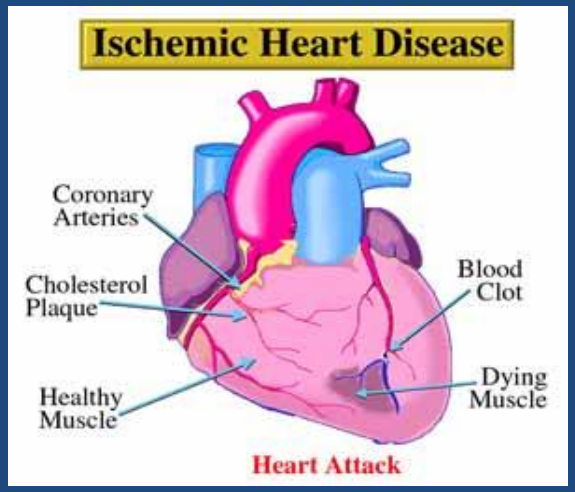


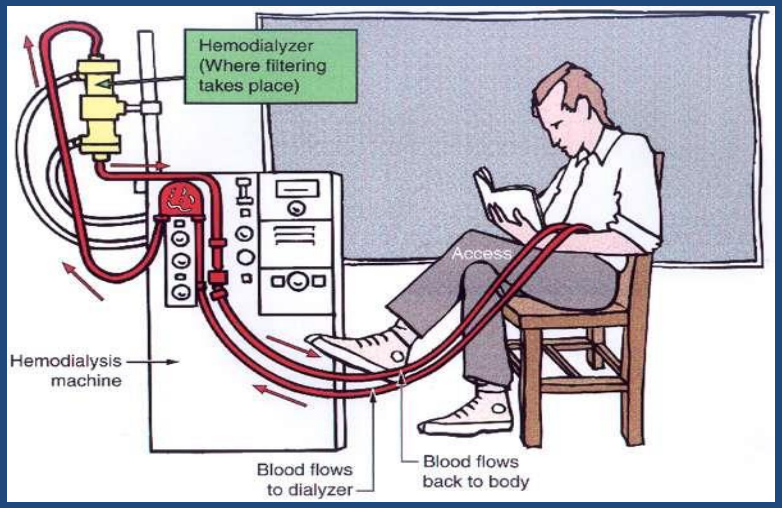
Types of DM and age in KSA

Type 1 is decreasing with age



Diabetic complications





- 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.

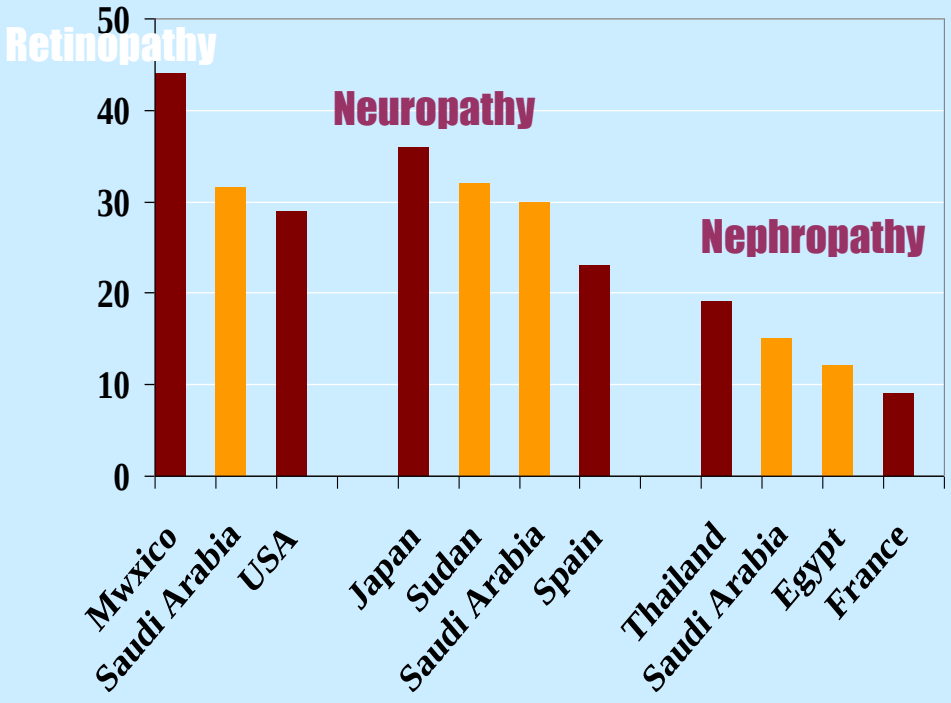
How do we screen for renal complications in a patient with diabetes mellitus?
1- Urine dipstick (on a community level)
We look for glucose, protein, albumin >>send to lab >> BUN , U&E + creatinine

Diabetes Complications in the Gulf Countries

Prevalence of microvascular complications:

Comparing data from Arab countries with data of the highest & lowest prevalence world wide in the year 2000.

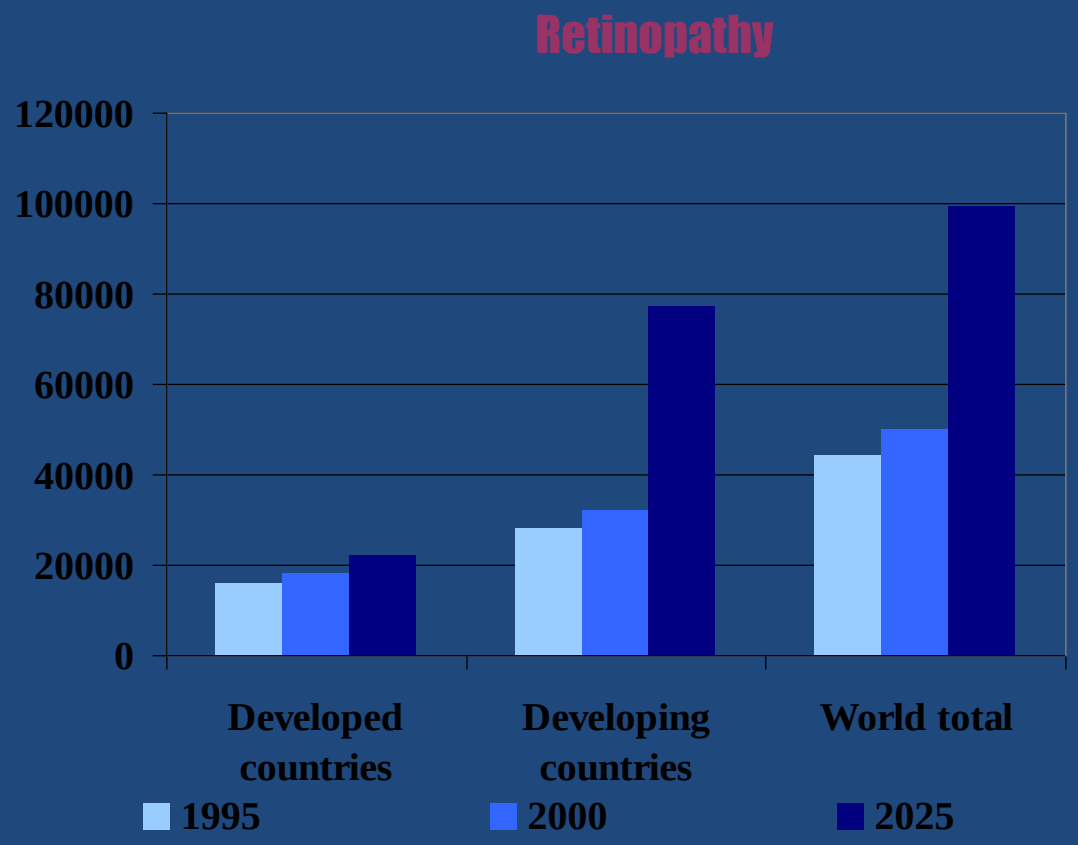
The major



Diabetes Complications in the Gulf Countries

Retinopathy:

Number of persons with diabetic retinopathy in different countries and according to the time.



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

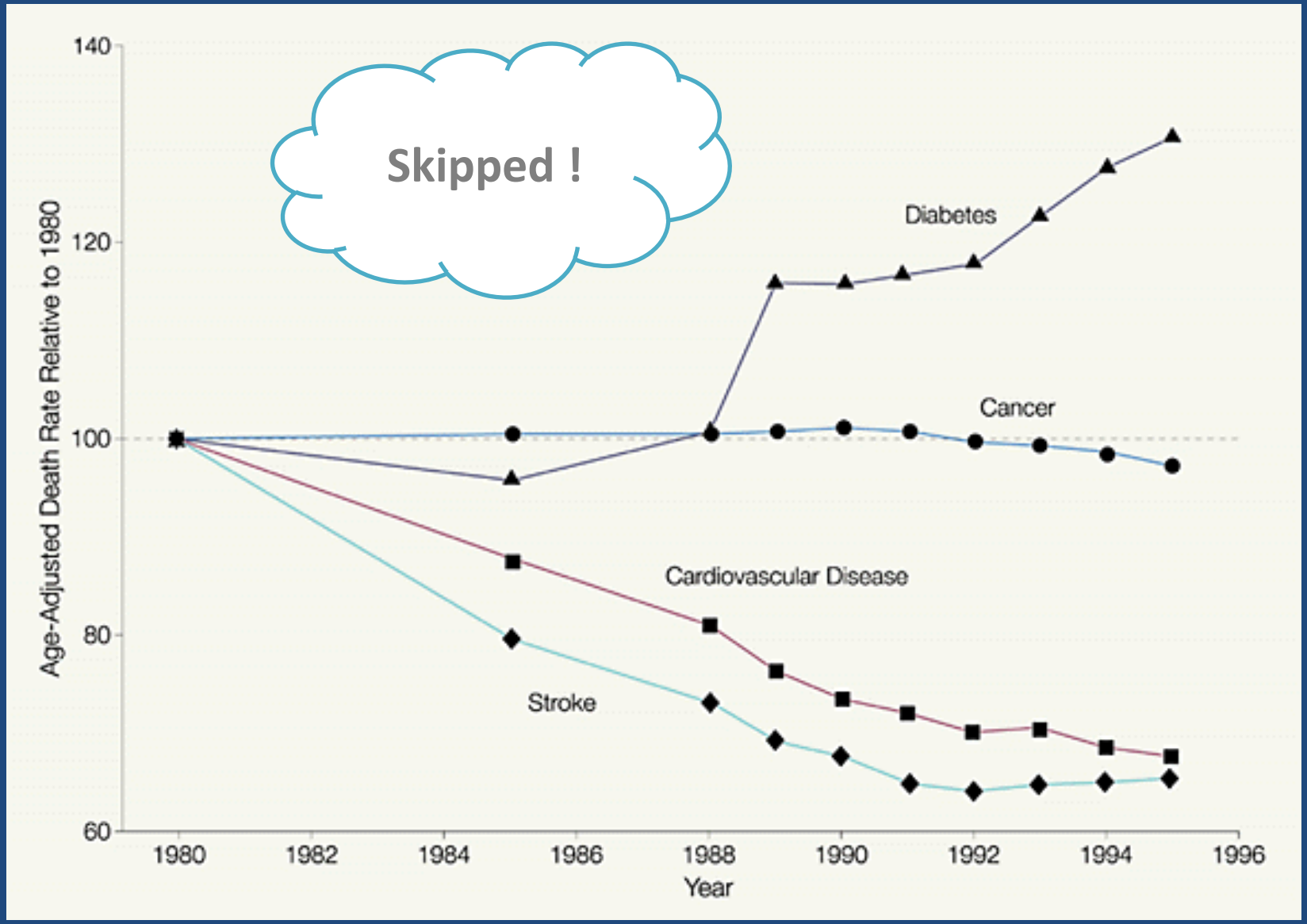
- Duration > 10 years.
- Presence of nephropathy.
- Older than 60 years.
- Poor diabetes control.
- Use of insulin.

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

Increasing mortality from diabetes mellitus



J. Olefsky, JAMA 2001:285:628-632

Risk factors

Genetic factors

- May play a part in development of all types; autoimmune disease and viral infections may be risk factors in Type I DM. (recently in type 2 also)

- Twin studies

Family history

- Compared with individuals without a family history of type 2 diabetes, individuals with a family history in any first degree relative have a two to three-fold increased risk of developing diabetes.
- 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 .
- The risk is likely mediated through genetic, anthropometric (body mass index, waist circumference), and lifestyle (diet, physical activity, smoking) factors.

Obesity

- Contributes to the resistance to endogenous insulin.
  - RR 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)

- The risk of impaired glucose tolerance (IGT) or type 2 diabetes rises with increasing body weight.

- The Nurses' Health Study demonstrated an approximately 100-fold increased risk of incident diabetes over 14 years in nurses whose baseline body mass index was >35 kg/m^2 compared with those with BMI <22 .
- The risk of diabetes associated with body weight appears to be modified by age.
- Obesity acts at least in part by inducing resistance to insulin-mediated peripheral glucose uptake, which is an important component of type 2 diabetes

Fat distribution

- The distribution of excess adipose tissue is another important determinant of the risk of insulin resistance and type 2 diabetes.
- The incidence of type 2 diabetes are highest in those subjects with central or abdominal obesity, as measured by waist circumference or waist-to-hip circumference ratio.
- Intra-abdominal (visceral) fat rather than subcutaneous or retroperitoneal fat appears to be of primary importance.

- **Physical inactivity.**

- prolonged TV watching is associated with a significantly increased risk of type 2 diabetes. Men who watched TV more than 40 h per week had a nearly threefold increase in the risk of type 2 diabetes compared with those who spent less than 1 h per week watching TV.

Diet.

- A number of dietary factors have been linked to an increased risk of type 1 diabetes, such as low vitamin D consumption; early exposure to cow's milk or cow's milk formula; or exposure to cereals before 4 months of age. However, none of these factors has been shown to cause type 1 diabetes.
- Consumption of red meat, processed meat, and sugar sweetened beverages is associated with an increased risk of diabetes

-Cow milk before 1 year of age is associated with an increased risk

-White meat is better than red meat

- Fruits, vegetables, nuts, whole grains, and olive oil is associated with a reduced risk.
- It is important to recognize that most studies have used food frequency questionnaires to capture dietary patterns and that none of the food stuffs examined can be considered in isolation. For example, higher meat intake always means more saturated fat intake, relatively lower fruit and vegetable intake, and frequently, higher BMI (body mass index).

Smoking .

Several large prospective studies have raised the possibility that cigarette smoking increases the risk of type 2 diabetes. In a meta-analysis of 25 prospective cohort studies, current smokers had an increased risk of developing type 2 diabetes compared with nonsmokers (pooled adjusted RR 1.4, 95% CI 1.3-1.6).

A definitive causal association has not been established, a relationship between cigarette smoking and diabetes mellitus is biologically possible based upon a number of observations:

- Smoking increases the blood glucose concentration after an oral glucose challenge.
- Smoking may impair insulin sensitivity.
- Cigarette smoking has been linked to increased abdominal fat distribution and greater waist-to-hip ratio that may have an impact upon glucose tolerance.

Infections

- A range of relatively rare infections and illnesses can damage the pancreas and cause type 1 diabetes.

" Viruses possibly associated with type 1 diabetes include coxsackievirus B, cytomegalovirus, adenovirus, rubella, and mumps. "

Pregnancy

Pregnancy causes weight gain and increases levels of estrogen and placental hormones, which antagonize insulin

Peripheral resistance

Medications

- Drugs that are known to antagonize the effects of insulin:
- Thiazide diuretics,
- Adrenal corticosteroids,
- Oral contraceptives.

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.

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Friedman JE, Dohm GL, Leggett-Frazier N, et al. Restoration of insulin responsiveness in skeletal muscle of morbidly obese patients after weight loss. Effect on muscle glucose transport and glucose transporter GLUT4. J Clin Invest 1992; 89:701. Mokdad AH, Ford ES, Bowman BA, et al. Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. JAMA 2003; 289:76.

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Nguyen

Del Prato S, Bonadonna RC, Bonora E, et al. Characterization of cellular defects of insulin action in type 2 (non-insulin-dependent) diabetes mellitus. J Clin Invest 1993; 91:484.

MCQS

- Q1: One of these is not a risk factor for DM :

  A-Smoking

  B-Pregnancy

  C-White meat

  D- Cows milk before 1 year of age

Answer is C

- Q2: Which one of the following is true?

A- Type 2 diabetes is increasing with age

B-Type 1 diabetes is increasing with age

C- It is estimated that the incidence of DM will decrease by 2030

Answer is A