MEDICINE

Epidemiology of Diabetes mellitus

OBJECTIVES :

1. To list the types of Diabetes Mellitus
2. To describe the prevalence of Diabetes Mellitus
3. To recognize the importance of diagnostic criteria for estimating the prevalence of diabetes mellitus
4. To discuss the risk factors and complications of type II diabetes mellitus

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medicine435.17@gmail.com

مصدر مذاكرة

Revised by
خولة العماري & هشام الغفيلي

IMPORTANT NOTES EXTRA MNEMONICS

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 (GDM) : glucose intolerance with onset or **first recognition** during **pregnancy**

Secondary diabetes :diabetes is a **secondary** condition that results because of **the main illness. If treat the main illness** the diabetes may disappear **e.g. cystic fibrosis, chronic pancreatitis,**

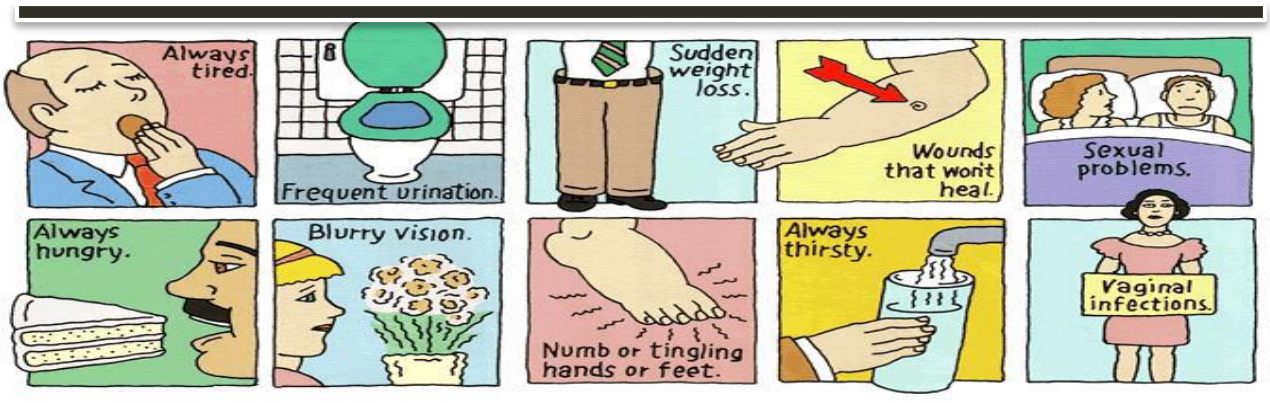
infections

Pre-diabetes : Impaired glucose tolerance May remain undiagnosed for years. a person with pre-diabetes has a blood sugar level higher than normal, but **not high enough for a diagnosis of diabetes.** risk of complications same as **for Type 2 Diabetes mellitus**

Symptoms:

- ✓ Thirst (polydipsia)
- ✓ Passing lots of urine (polyuria)
- ✓ Malaise
- ✓ Infections (thrush)
- ✓ Weight loss

BUT – many years of pre-diabetes (type 2) before these symptoms appear: patient who have been diagnosed with DM type 2 started with sub-clinical (pre) DM before developing these symptoms *gradual*



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Biochemical tests :

•**Random plasma glucose:** measures plasma or blood glucose levels, performed with small blood draw taken at any time of the day "random" + no need for fasting.

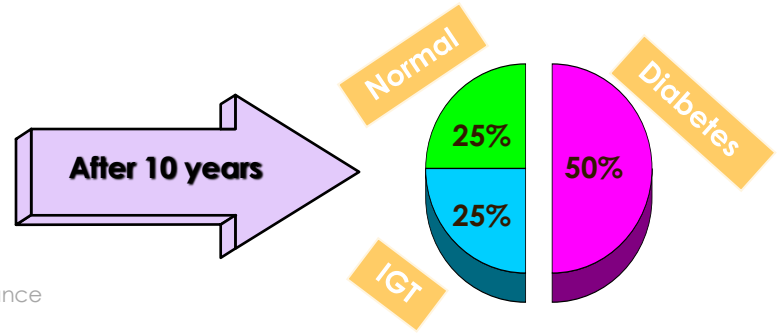
•**Fasting plasma glucose** : relatively simple and inexpensive test that exposes problems with insulin functioning patient should fast for 6-8 hours.

1.Non diabetic: < 110 mg/dl (6.1 mmol/dl). *dr.Nora stressed on the units*
2.Glucose Intolerance: 110 -125 mg/dl (6.1-6.9 mmol/dl). Has high risk for type 2 DM
3.Diabetic: >126 mg/dl (>7 mmol/dl)
4.Random: >200 mg/dl (>11.1 mmol/dl) .

•**Oral glucose tolerance test – 2h post 75g glucose (The diagnosis based on it)**:
1.If < 7.8 mmol/L ⇢ **normal GTT**
2.If ≥ 7.8 mmol/L and < 11.1 mmol/L ⇢ **Impaired GTT**
3.If ≥ 11.1 mmol/L ⇢ **provisional diagnosis of Diabetes**

Natural History of IGT

Impaired Glucose Tolerance



Patient did glucose test and the result showed he has IGT, after 10 years:

25% will be normal healthy individuals

25% will still have IGT

50% will be diabetic

Why diabetes so important?

The burden to patients, carers by supplying the health care to the disease it self and to manage each of the **complications** &**cost**

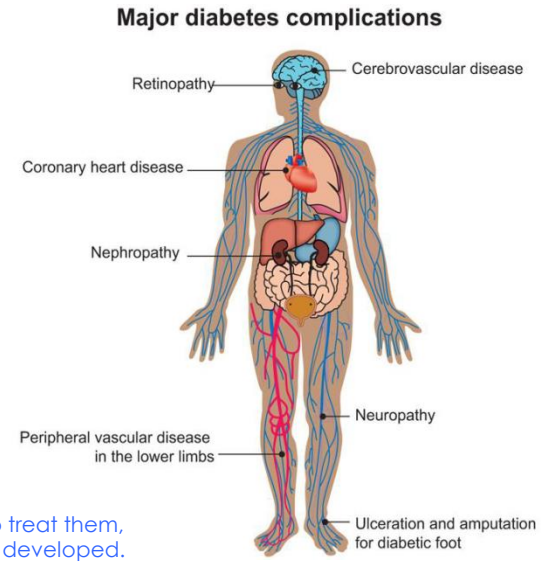
1) Complications :

- ✓ Cardiovascular
- ✓ Eyes
- ✓ Renal - Hypertension, renal failure
- ✓ Feet amputations
- ✓ Skin, infections, sexual, psycho-sexual, depression
- ✓ Quality of life
- ✓ Premature mortality

2) Cost :

Studies have shown that diabetes is a costly disease
Type 2 diabetes accounted for between 3% and 6% of total healthcare expenditure in eight European countries
Hospital in-patient costs are the largest single contributor to direct healthcare costs

DM is so costly because it develop al these complications and you need to treat them, especially in developing countries where prevention programs are not fully developed.



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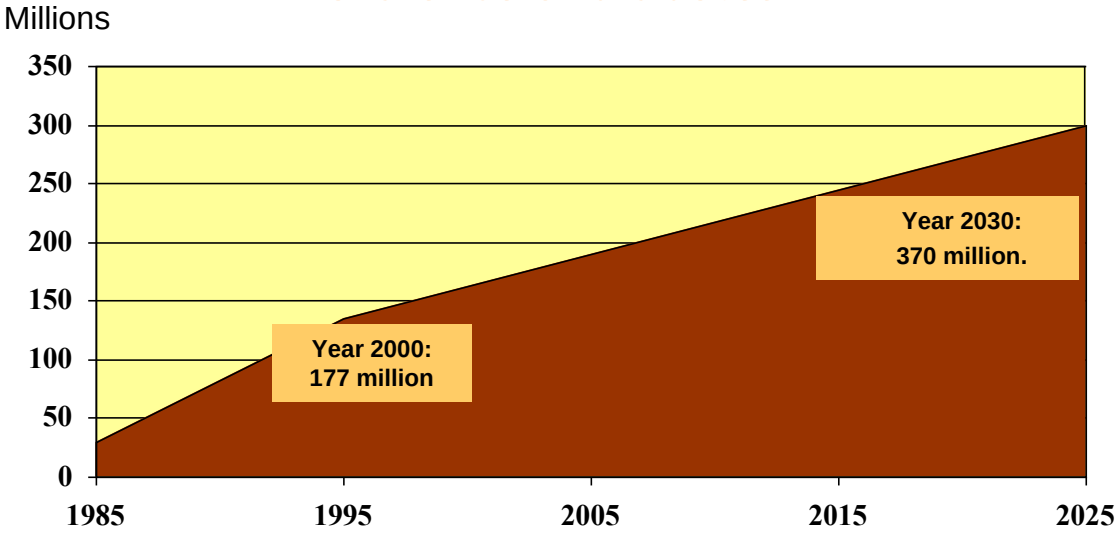
Prevalence of diabetes



In 2000, 177 m people were diagnosed with DM
In 2030 predicted number is 370 m
So the number is dramatically increasing, **why?**

- Urbanization and lifestyle changes
  Less activity, low cost and easily available bad food.
- increased numbers of people being diagnosed with type 2 diabetes, and enhanced survival rates of those diagnosed will increase prevalence.
  Because screening programs are getting better and we can identify people with diabetes easier so you can say the prevalence is higher, because we are finding them ! We are diagnosing them ! So this is because of our programs otherwise the patients were the same from the beginning.
- Longevity
  Because of the better prevention programs so people wont die from the complication of diabetes, so we will have more of them and the prevalence is higher. This is mostly in developed countries because they have good screening and diabetes prevention programs.

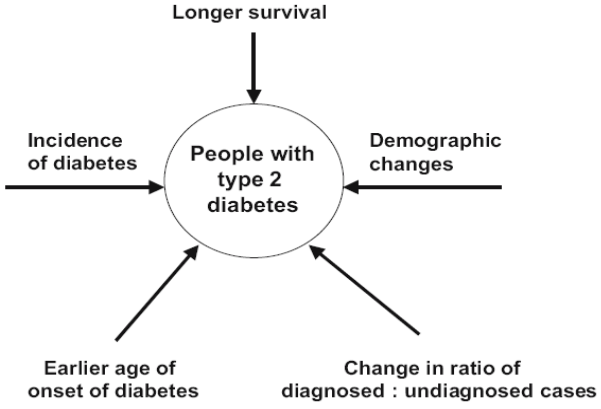


Fig. 1 Diabetes epidemiological model. Factors directly affecting the prevalence of diabetes included in the present analysis

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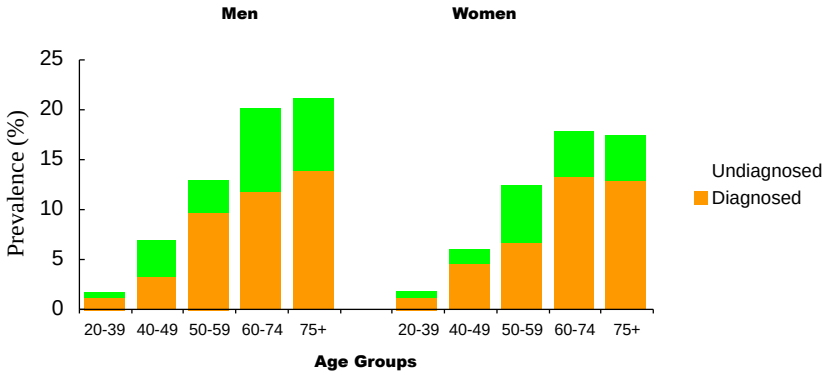
Epidemiology of Diabetes worldwide :

Prevalence is increasing

- in 2000 2.8% = 177 million
- In 2030 4.4% worldwide = 370 million ***Increase 213%***

- Greatest rise in **developing** (poorer) world **why?**
  Because of urbanization and lifestyle changes.
- Prevalence estimates only include reported and diagnosed person.
- there is a large % that is undiagnosed as well as a large % at high risk of developing DM.

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



Considering that this study only in the us
The box below is all u need !

As u can see the diagnosed are more than the undiagnosed in all age groups
And higher in old men
+
The prevalence is increasing with age

There are more studies mentioned in the lecture u can find them all in a separate page at the end

EXTRA TABLE

Age group	Estimated number of people in Developed countries	Estimated number of people in Developing countries
20-44	**Less people with DM** Because they have good screening and prevention programs	high number
45-64	Less than the developing countries	very high number
65+	Higher number than (45-64) because of the good serves there is less morbidity and less mortality But still lower than the developing countries	most of them die because of the low quality serves and the complications of DM, so we have **less people with diabetes**

The most affected age group :

Devolved countries ⇨ elderly Developing countries ⇨ middle age

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Epidemiology of Diabetes in USA

- Diabetes affects 25.8 million people of all ages
- 8.3% of the U.S. population : Diagnosed: 18.8 million & Undiagnosed: 7.0 million
- Leading cause of kidney failure, nontraumatic lower-limb amputation, & new cases of blindness among adults
- Major cause of heart disease and stroke
- Seventh leading cause of death

Annual U.S. Diabetes Burden in 2050

- By 2050, prevalence of total diabetes (diagnosed & undiagnosed) is projected to increase from (**1 in 10** adults) to between (**1 in 5** and **1 in 3** adults)
- Largely attributed to three key factors:
  - ✧ Aging of the U.S. population.
  - ✧ Increasing size of higher-risk minority populations :because of the immigration to the US from populations that had the gene for DM (e.g. India)
  - ✧ Declining mortality among those with diabetes.

Countries with the highest prevalence of diabetes:

The most affected area by diabetes is **Arabian gulf area**
Saudi Arabia has the **highest percentage after Iraq in low physical activity** and **Low** fresh fruit and vegetables intake

Diabetes Mellitus in the Gulf Countries:

UAE is the highest in:

•Impaired Glucose Tolerance Prevalence (KSA is the 3rd)

•Diabetes Mellitus Prevalence (KSA is the 4th)

At least memorize the numbers of KSA and understand why UAE on the top in the comparative prevalence

Comparative Prevalence 2010:
1- UAE (18.7) why? Maybe because the immigration is higher otherwise all gulf countries have the same genes.
2- KSA (16.8)
3- Qatar & Bahrain (15.4) 4- Kuwait (14.6) 5- Oman (13.4)

Impaired Glucose Tolerance Prevalence 2010:
1- UAE, Kuwait, Bahrain and Qatar (18.8)
2- KSA (12.5) 3- Oman (10.9)

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Countries with the highest prevalence of diabetes:

- **India**, China, and the United States have the greatest number of people with diabetes in 2010, and these countries are expected to maintain their high prevalence numbers until 2030
- Nauru ,UAE, KSA have the highest percentage of people with diabetes
- The most affected area by diabetes is **Arabian gulf area**

Prevalence of diabetes based on stepwise surveys:

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

Prevalence of T2DM in urban and rural areas in the Arabic-speaking countries in 2011 in 20-79 age groups

- The **highest** number in **both** urban and rural community is found in **Egypt**
- The second highest number in **urban** is **Saudi Arabia**

Remember DM is more common in urban not rural areas !
Also people in developing countries has higher risk the developed countries !

Diabetes and obesity :

-(comparative)The relative risk of high BMI to develop DM in females (ref. BMI < 22Kg/m2)(the normal BMI with the higher one)

-Females of **BMI >35** has **93 times** the risk of developing diabetes compared to those with **BMI<21**

-Increase in mean weight by **one kg** increase the risk of diabetes by **4.5%** (recent data - 9%)

Female BMI and the risk of developing DM:

22-23 ⇨ **the risk is 3 times more**
24-25 ⇨ **5 times more**
> 30 ⇨ **40 times more**

Not all obese have diabetes.
Central obesity lead to diabetes risk

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Diabetes Complications epidemiology :

Prevalence of micro vascular complications:

- The major complications will be soon the highest in Arab countries due to the lack of prevention programs , Genetics, environmental and life style reasons as well

Patient with **non insulin dependent diabetes mellitus (type 2)**has a higher risk to develop NEUROPATHY

- countries with **highest** prevalence of these complications:

Retinopathy ⇨ **Mexico** 1st, and Saudi 2nd

Neuropathy ⇨ **Japan** 1st, and Saudi 3ed

Nephropathy ⇨ **Thailand** 1st, and Saudi 2nd

- 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**
- 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.

Complications in general are more common in non-insulin dependent DM (NIDDM) than in insulin dependent DM (IDDM)

NIDDM = TYPE 2 DM , IDDM = TYPE 1

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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.

- Important factors are physical inactivity, dietary imbalance

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

✓ **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.

✓ **Obesity:** Contributes to the resistance to endogenous insulin.

✓ **physical inactivity**

✓ **Infections**

✓ **dietary imbalance**

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

✓ **Medications:** Drugs that are known to antagonize the effects of insulin: **Thiazide diuretics, adrenal corticosteroids, oral contraceptives**

Future Directions

•Tackling environmental factors and lifestyle

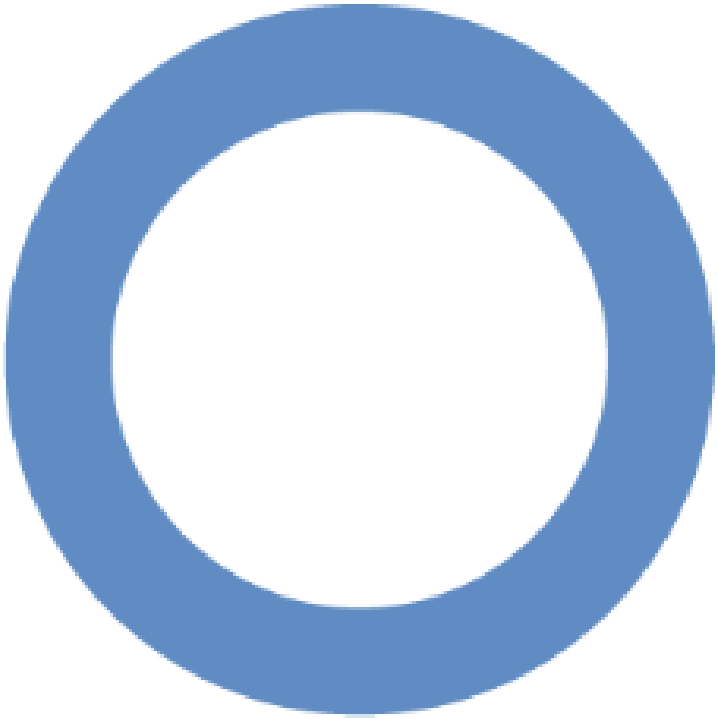
•Appropriate use of screening tools to control diabetes mellitus

•Early interventions in high risk populations

•Therapeutic and management choices and updated criteria for treatment

•Rehabilitation services for complications

‘Obesity and physical activity are the most preventable risk factors for diabetes, and could potentially lead to more than 50% reduction in prevalence of the diabetes’

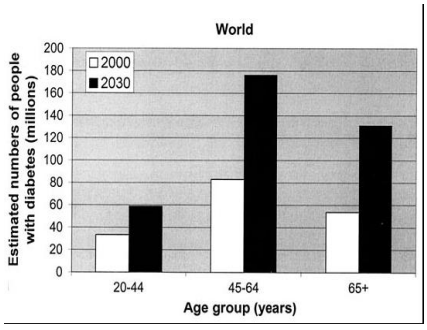


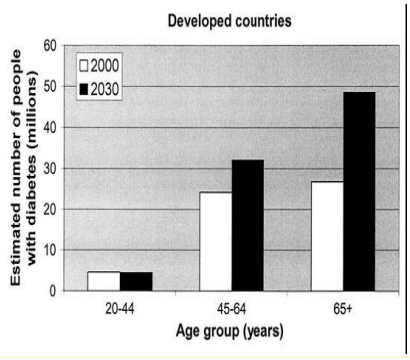
World diabetes day

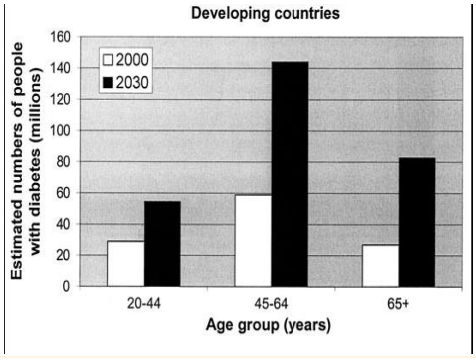
14 November

THE END

Graphs for some studies that were mentioned in the slides + doctor notes







World : the estimated number of people in the age group (45-64) is higher than people who are (2o-44) & (65+)
Developed countries : they have good screening and prevention programs less morbidity and less mortality that means older people with diabetes.
Developing countries : unlike the developed countries here we have high number in the age group (20-44) and a very high number in (45-64) most of them die because of the low quality serves and the complications of DM, so we have less people with diabetes in the age of (65+)

	Country/Territory	2010 Millions		Country/Territory	2030 Millions
1	India	50.8	1	India	87.0
2	China	43.2	2	China	62.6
3	USA	26.8	3	USA	36.0
4	Russian Federation	9.6	4	Pakistan	13.8
5	Brazil	7.6	5	Brazil	12.7
6	Germany	7.5	6	Indonesia	12.0
7	Pakistan	7.1	7	Mexico	11.9
8	Japan	7.1	8	Bangladesh	10.4
9	Indonesia	7.0	9	Russian Federation	10.3
10	Mexico	6.8	10	Egypt	8.6

Estimated Number of People with Diabetes Worldwide, 2010 and 2030

What you need to know is that from 2010 to 2030 the number is increasing !

Stepwise Approach to Non Communicable Diseases WHO data from some EM countries

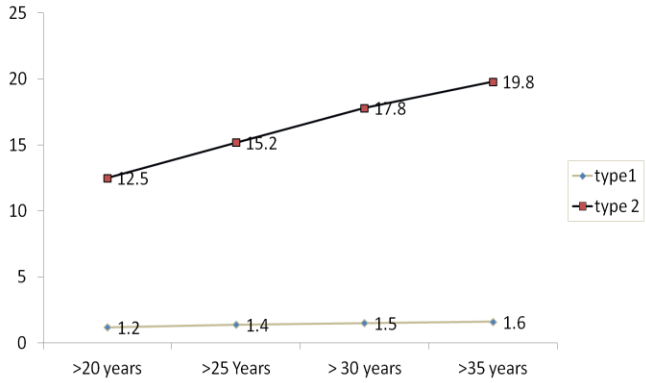
Country	Year of field work	Diabetes %	Hypertension %	Overweight & Obesity %
Iraq	2006	10.4	40.4	66.9
Jordan	2007	16	25.5	67.4
Saudi Arabia	2005	17.9	26	
Syrian Arab Republic	2003	19.8	28.8	56.3
Kuwait	2005	16.7	24.6	81.2
Egypt	2005	16.5	33.4	76.4
Sudan	2005	19.2	23.6	53.9

Stepwise Approach to Non Communicable Disease WHO data from some EM countries

Country	Year of field work	Hyper-cholestrolemia %	Smoking %	Low physical activity %	Low intake fresh fruit vegetables %
Iraq	2006	37.5	21.6	56.7	92.3
Jordan	2007	26.2	29	5.2	14.2
Saudi Arabia	2005	19.3	12.9	33.8	91.6
Syrian Arab Republic	2003	33.5	24.7	32.9	95.7
Kuwait	2005	42	15.7	91.5	89
Egypt	2005	24.2	21.8	50.4	79
Sudan	2005	19.8	12	86.8	1.7/day

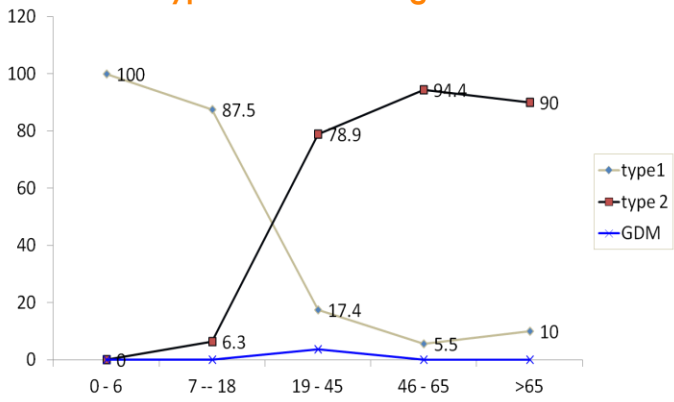
Graphs for some studies that were mentioned in the slides + doctor notes

Diabetes mellitus & age distribution in KSA



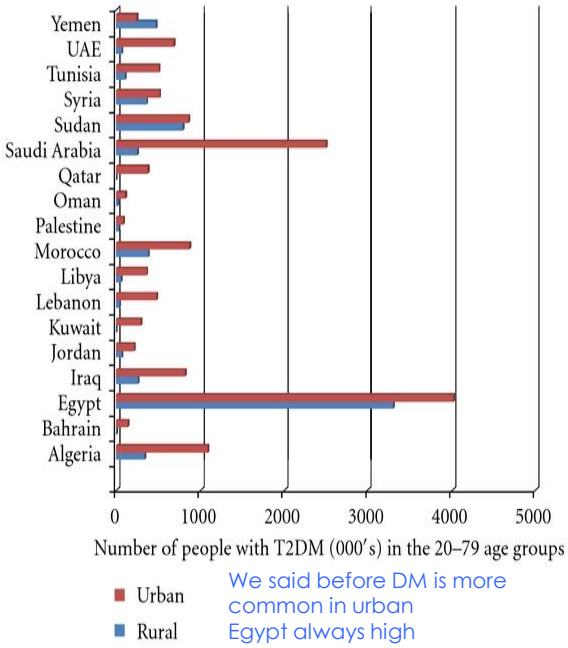
As you can see the prevalence of type 2 DM is more common than type 1
in type 1 the prevalence won't increase very high because it's a disease of children
For type 2 with increase ages the chance will increase and so the prevalence

Types of DM and age in KSA



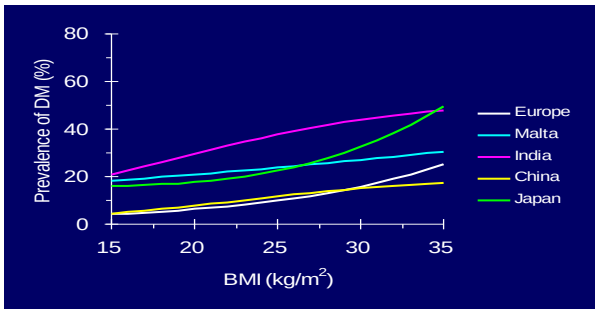
GDM :almost zero but it peaks between 19-45 because of it's the age of pregnancy then it declines
Type 1 diabetes : the percentage goes down with age
type tow diabetes goes up with age

Prevalence of T2DM in urban and rural areas in the Arabic-speaking countries in 2011 in 20-79 age groups

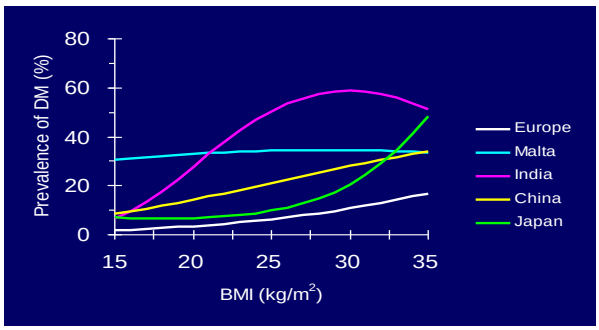


We said before DM is more common in urban
Egypt always high
You can se Saudi there..

Prevalence of DM in 60 years old Men

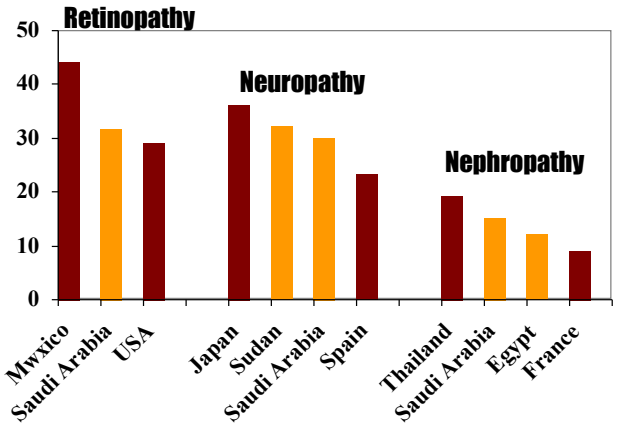


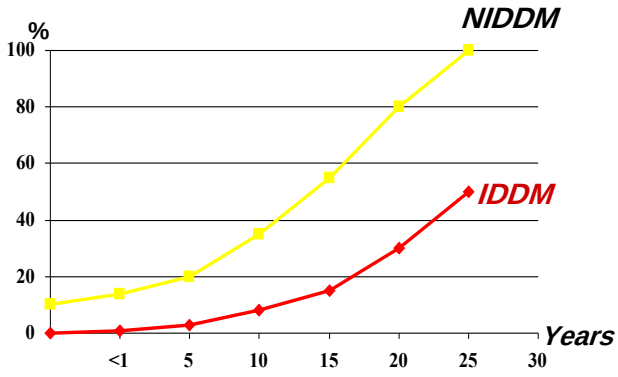
Prevalence of DM in 60 years old women



Graphs for some studies that were mentioned in the slides + doctor notes

Diabetes Complications





NEUROPATHY WITH DURATION

RETINOPATHY

Chronic complication of diabetes in North Africa 1995-2012

Author (year)	Location	Sample	Setting	Type of Diabetes	Prevalence %
Macky 2011	Egypt	1325	Clinic	Mixed	20.5
Kadiki 1999	Egypt	960	Clinic	Type 2	30.5
Elbagir 1995	Sudan	91	Clinic	Mixed	43
Harzallah 2006	Tunisia	370	Inpatient /clinic	Mixed	8.1

ALBUMINURIA AND NEPHROPATHY

Chronic complication of diabetes in North Africa 1995-2012

Author (year)	Location	Sample	Setting	Type of Diabetes	Prevalence
			ALBUMINURIA		
Herman 1998	Egypt	1451	clinic	Mixed	21.0
Elbagir 1995	Sudan	128	clinic	Mixed	*Proteinuria:* 22
			NEPHROPATHY		
Herman 1998	Egypt	1451	clinic	Mixed	6.7
Kadiki 1999	Libya	960	clinics	Type 2	25.2
Harzallah 2006	Tunisia	370	inpatient &CliniC	Mixed	13.1

NEUROPATHY

Chronic complication of diabetes in North Africa 1995-2012

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Herman 1998	Egypt	1451	Clinic	Mixed	21.9
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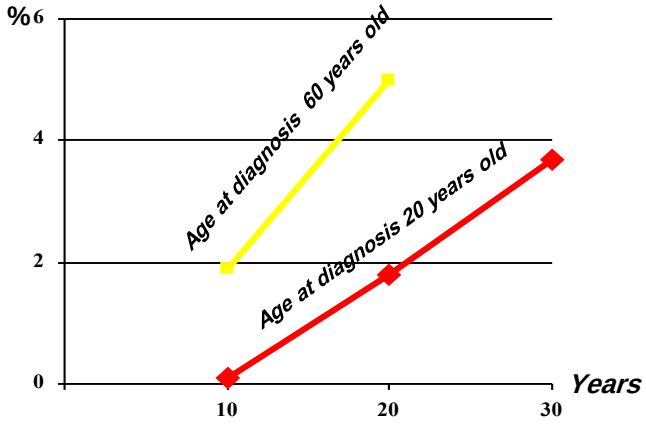
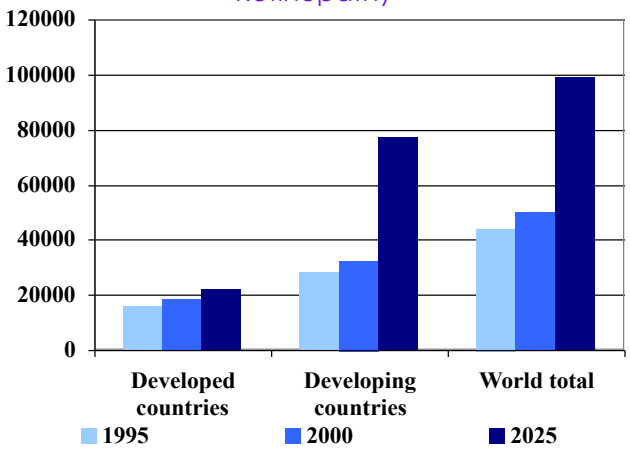
Elmagir. 1998	Sudan	128	Outpatient	Mixed	36.7
Harzallah 2006	Tunisia	370	Inpatient/ clinic	Mixed	24.3

BLINDNESS BY DURATION OF DIABETES



Retinopathy



MCQs

1)Which of the following hormones is not an antagonist of insulin:

A-Cortisol
B-Growth hormone
C-Glucagon
D-ADH

2)the most serious complication of diabetes and eventually leading to death:

A- amputation and gangrene
B-Acute Renal Failure
C-Retinopathy and Blindness
D-Cardiovascular diseases.

3) **A fasting blood glucose test level of —indicates diabetes.**

A-50 mg/dl to 69 mg/dl
B-70 mg/dl to 99 mg/dl
C-100 mg/dl to 125 mg/dl
D-126 mg/dl or higher

4) Long-term complications of diabetes include _____.

A- increased risk for high blood pressure and atherosclerosis
B-impaired sensation in the hands and feet
C-increased risk for kidney failure
D-All the complications listed are correct.

5)Which is the most common form of diabetes?

A-type 1 diabetes mellitus
B-diabetes insipidus
C-type 2 diabetes mellitus
D-They are all about the same frequency

6) When a pregnant woman develops diabetes mellitus it is called _____.

A-diabetes insipidus
B-gestational diabetes
C-type 1 diabetes mellitus
D-type 2 diabetes mellitus

7) Which of the following Gulf countries has highest Diabetes Mellitus Prevalence ?

A-UAE
B-KSA
C-Qatar
D-Oman

8) What is the most common type of Diabetes in subject under 18?

A-diabetes insipidus
B-gestational diabetes
C-type 1 diabetes mellitus
D-type 2 diabetes mellitus

1)D 2)D 3)D 4)D 5)C 6)B 7)A 8)C

Resources: Female and male slides

FOR FURTHER EXPLANATION, CORRECTION OR IF YOU WANT THIS LECTUER IN OTHER FORMAT CONTACT US ON
medicine435.17@gmail.com

THANK YOU !

*FOR CHECKING OUR WORK ^^*

AND

SPECIAL THANKS FOR OUR TEAM MEMBERS

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GHADEER ASIRI

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