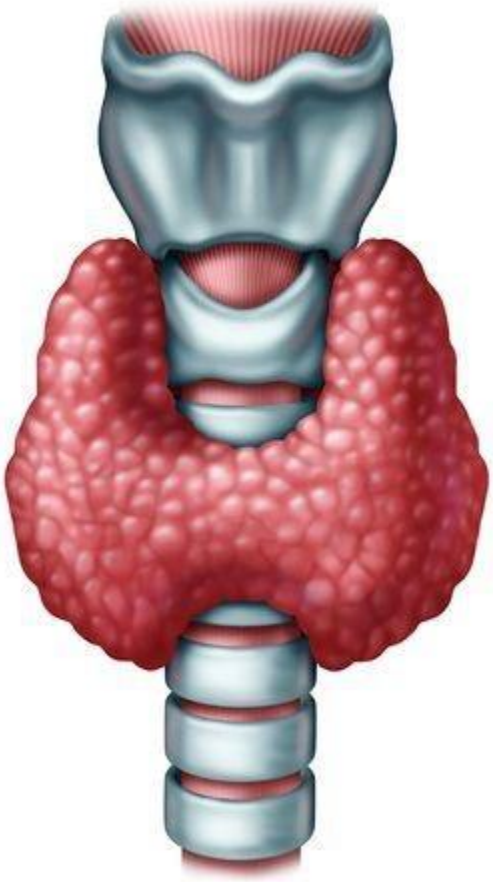

Diabetes mellitus

Objectives

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

Revised By
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Color index:

- Important
- Notes
- Extra
- Girls' slides

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Reference: Girls' & Boys' Slides

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Waiting for your Feedback

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.

Main types of diabetes

Type 1	(5-10%) – due to autoimmune b-cell destruction, usually leading to absolute insulin deficiency. Usually affects younger age group (not always), sudden onset absolute deficiency in insulin.
Type 2	(90 - 95%) – due to a progressive loss of β-cell insulin secretion frequently on the background of insulin resistance. Usually older age group (not always). gradual onset of relative insulin insensitivity.
Gestational diabetes	diabetes diagnosed in the second or third trimester of pregnancy that was not clearly overt diabetes prior to gestation, (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy.
Specific types of diabetes due to other causes	e.g., neonatal, maturity-onset diabetes of the young, diseases of the exocrine pancreas, drug- or chemical-induced diabetes.
Impaired glucose tolerance (IGT) and impaired fasting glycaemia (IFG)	intermediate conditions in the transition between normal blood glucose levels and diabetes (especially type 2).
Secondary diabetes	The diabetes is not the main illness, a secondary condition that results because of the main illness. If it is possible to treat the main illness successfully the diabetes may/will disappear e.g. cystic fibrosis, chronic pancreatitis, infections.
Pre-diabetes	Impaired glucose tolerance A person with pre-diabetes has a blood sugar level higher than normal, but not high enough for a diagnosis of diabetes; & is at higher risk for developing type 2 diabetes. May remain undiagnosed for years; risk of complications same as for T2DM

The scientists and researchers are focused on type 2 diabetes because it is the most common and the type of diabetes that can be prevented and treated.

Symptoms

- Increase frequency of Urine (pee)
- Increase thirst
- Weight loss
- Increase appetite
- Blurred vision
- Tingling hands and feet
- Easy fatigability
- Dry skin
- Slow healing wounds

Diagnosis

The doctor said: it is very important to know the diagnosis methods and numbers.

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

Diagnosis:

- Random plasma glucose
- Fasting plasma glucose
- Oral glucose tolerance test – 2h glucose

1. Symptoms of diabetes plus casual plasma glucose concentration ≥200 mg/dl (11.1 mmol/l). Casual is defined as any time of day without regard to time since last meal. The classic symptoms of diabetes include polyuria, polydipsia, and unexplained weight loss.
OR

2. FPG ≥126 mg/dl (7.0 mmol/l). Fasting is defined as no caloric intake for at least 8 h.
OR

3. 2-h postload glucose ≥200 mg/dl (11.1 mmol/l) during an OGTT. The test should be performed as described by WHO, using a glucose load containing the equivalent of 75 gms glucose dissolved in water.

Ref: Diagnosis and Classification of Diabetes Mellitus American Diabetes Association Diabetes Care 2006 Jan; 29(suppl 1): s43-s48

The corresponding categories when the OGTT is used are the following:
2-h postload glucose <140 mg/dl (7.8 mmol/l) = normal glucose tolerance;
2-h postload glucose 140–199 mg/dl (7.8–11.1 mmol/l) = IGT (impaired glucose tolerance);
2-h postload glucose ≥200 mg/dl (11.1 mmol/l) = provisional diagnosis of diabetes (the diagnosis must be confirmed)

The International committee on DM, recognized an intermediate group of subjects whose glucose levels, although not meeting criteria for diabetes, are nevertheless too high to be considered normal.
The categories of FPG values are as follows:
FPG <100 mg/dl (5.6 mmol/l) = normal fasting glucose;
FPG 100–125 mg/dl (5.6–6.9 mmol/l) = IFG (impaired fasting glucose);
FPG ≥126 mg/dl (7.0 mmol/l) = provisional diagnosis of diabetes (the diagnosis must be confirmed)

Why is diabetes so important?

- The burden to patients and the family
- Burden for the health system
- Complications
- Cardiovascular
- Eyes
- Renal - Hypertension, renal failure
- Feet and Skin infections,
- sexual, psycho-sexual, depression
- Quality of life
- Premature mortality

Global Prevalence of Diabetes

- Prevalence worldwide is increasing
- 2.8% in 2000;4.4% in 2030 worldwide (171 million in 2000; 366 million in 2030)
- DM worldwide was already 366 million by 2011
- The prevalence increased to 382 millions (8.2%) by 2013
- There is a large % that is undiagnosed as well as a large % at high risk of developing DM
- A huge percentage of the reported diabetics are in the 40-59 age group, among whom 80% live in countries with low and middle-income economies
- In 2013, about half of all diabetes-related deaths in adults were in the age group below 60 years.
- Every six seconds there is a diabetes-related death and in the more poorly-developed regions
- 35 out of 219 countries [16% of the total] show very high prevalence of diabetes, more than 12%
- These countries fall mainly in the regions of the Western Pacific, North Africa and Middle East

The doctor said: prevalence percentages are Not important (they won't ask about it) But try to understand it

Regional and local prevalence

- Six of the top ten countries having the highest prevalence rates of diabetes globally are found in the Gulf region, viz., Kuwait, Lebanon, Qatar, Bahrain, UAE and Saudi Arabia
- Bahrain 15.4%; Kuwait 14.6%; UAE 18.7%; Qatar 15.4%
- There are 20 Arab countries in which nearly 20.5 million people are living with diabetes and another 13.7 million are in the pre-diabetes stage, with Impaired Glucose Tolerance (IGT)
- The number of deaths attributed to diabetes in Saudi Arabia is about 170,000 adults, which is greater than 10% of all deaths in the country

Diabetes - an escalating problem in the Kingdom of Saudi Arabia

1982	2.5% (age >15)	***Bacchus & Madkour***
1987	4.3%	***Fatani***
1992	4.6%	***AbuZaid***
1996	9.5% (age >14 years)	***Hazmi***
1997	17% (age >30 years)	***Nuaim***
2004	24% (age >30 years)	***Nozha***
2014	25% (age >30 years)	***MOH***

The eastern Mediterranean show dramatic increasing in the incidences of diabetes." Most rapidly increased region worldwide"

Diabetes Mellitus and KSA

- WHO ranks SA second in the prevalence of diabetes in the Middle East region
- KSA has reached a point where DM is considered an **epidemic**
- A more recent study reported that the prevalence of diabetes had risen to 34.1% in males and 27.6% in females.
- The mean reported age for diabetes onset in males and females was 57.5 and 53.4 years, respectively
- The overall prevalence of DM in Saudi Arabia, and especially in the central region (Riyadh), was 23.7% (age group 30-70 years), while another 14.1% had IFG
- The incidence of diabetes was significantly higher in the urban regions (25.5% vs 19.5% in the rural areas)
- The incidence of T1DM is on the increase over the last 30 years
- The prevalence of T1DM among the Saudi children and adolescents is 109.5 per 100,000

SA is among the leading countries of diabetes prevalence.

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

Extra: Diabetes Mellitus

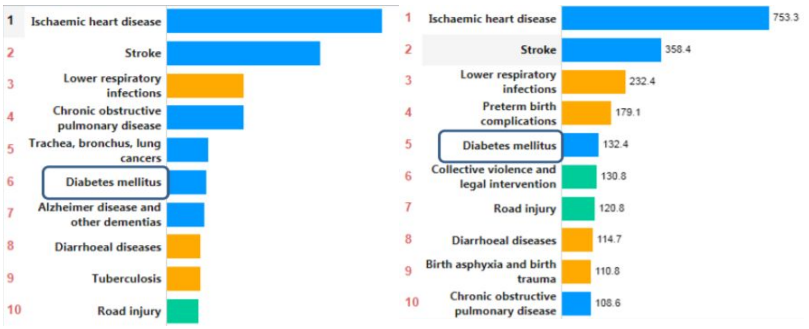
Diabetes mellitus is a syndrome of impaired carbohydrate, fat, and protein metabolism caused by either lack of insulin secretion or decreased sensitivity of the tissues to insulin. There are two general types of diabetes mellitus:

1. Type 1 diabetes, also called insulin-dependent diabetes mellitus, is caused by lack of insulin secretion.
2. Type 2 diabetes, also called non–insulin-dependent diabetes mellitus, is initially caused by decreased sensitivity of target tissues to the metabolic effect of insulin. This reduced sensitivity to insulin is often called insulin resistance.

In both types of diabetes mellitus, metabolism of all the main foodstuffs is altered. The basic effect of insulin deficiency or insulin resistance on glucose metabolism is to prevent the efficient uptake and utilization of glucose by most cells of the body, except those of the brain. As a result, blood glucose concentration increases, cell utilization of glucose falls increasingly lower, and utilization of fats and proteins increases.

Diabetes Mellitus

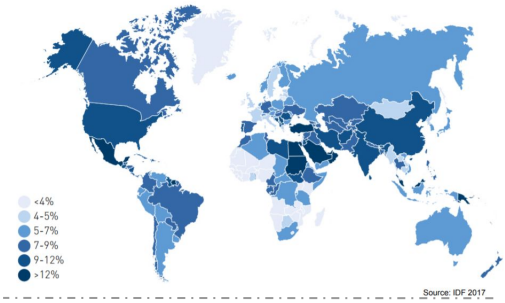
Top 10 causes of death



World, 2015 EMRO, 2015

Crude death rates (per 100,000)

Estimated age-adjusted prevalence of diabetes in adults (20-79 years), 2017



Estimated prevalence and number of people with diabetes (adults 18+ years)

WHO Region	Prevalence (%)		Number (millions)	
	1980	2014	1980	2014
African Region	3.1%	7.1%	4	25
Region of the Americas	5%	8.3%	18	62
Eastern Mediterranean Region	5.9%	13.7%	6	43
European Region	5.3%	7.3%	33	64
South-East Asia Region	4.1%	8.6%	17	96
Western Pacific Region	4.4%	8.4%	29	131
Total[a]	**4.7%**	**8.5%**	**108**	**422**

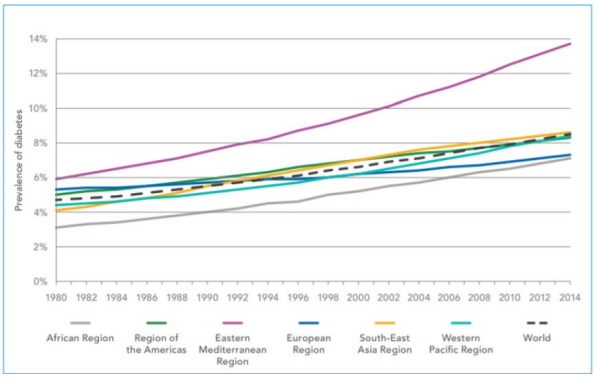
a. Totals include non-Member States.

Source: (4).

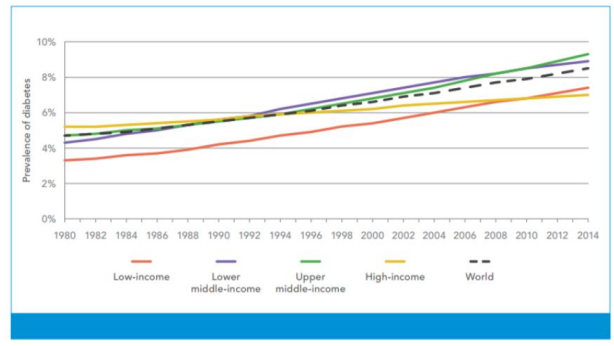
High blood glucose age-standardized mortality rates per 100000 by WHO region, age 20+, 2012

	Both sexes	Female	Male
African Region	111.3	110.9	111.1
Region of the Americas	72.6	63.9	82.8
Eastern Mediterranean Region	139.6	140.2	138.3
European Region	55.7	46.5	64.5
South-East Asia Region	115.3	101.8	129.1
Western Pacific Region	67	65.8	67.8

Trends in prevalence of diabetes, 1980–2014, by WHO region

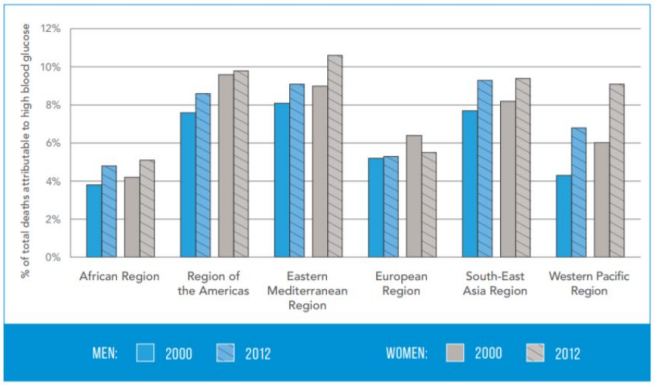


Trends in prevalence of diabetes, 1980–2014, by country income group

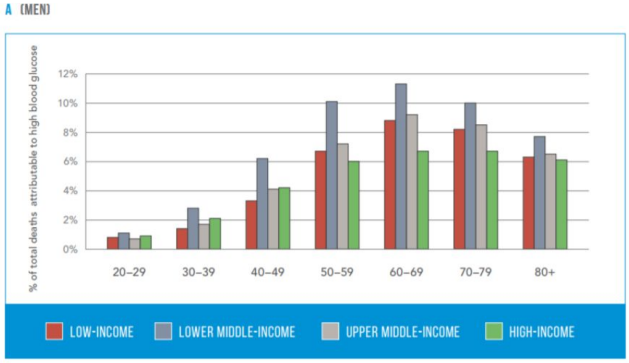


Diabetes Mellitus

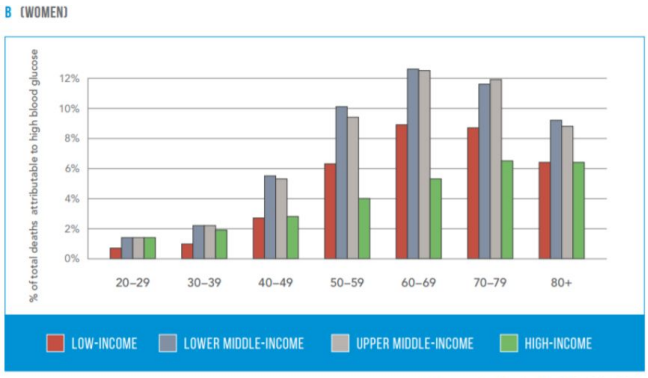
Percentage of all deaths attributable to high blood glucose for adults aged 20–69 years, by WHO region and sex, 2000 and 2012



Percentage of all-cause deaths globally attributed to high blood glucose in men, 2012



Percentage of all-cause deaths globally attributed to high blood glucose in women, 2012

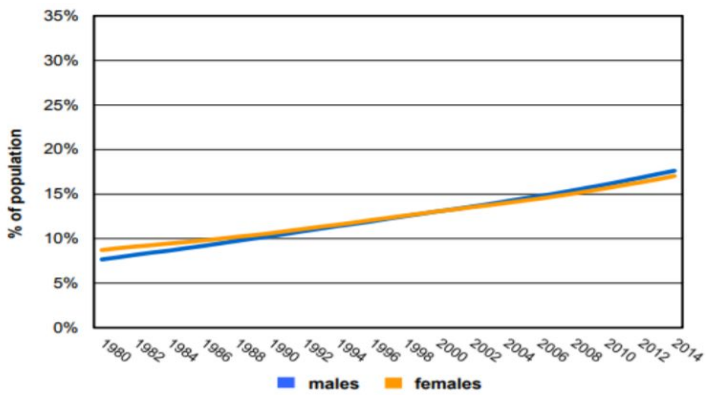


a. As categorized by the World Bank for 2012.

Diabetes prevalence (% of population ages 20 to 79)

Rank	Country	%	Year
1	Tuvalu	27.25	2017
2	Nauru	24.07	2017
3	New Caledonia	23.36	2017
4	Kiribati	22.66	2017
5	Mauritius	22.02	2017
6	Solomon Islands	18.68	2017
7	Saudi Arabia	17.72	2017
8	Papua New Guinea	17.65	2017
9	Egypt	17.31	2017
10	United Arab Emirates	17.26	2017

Trends in age-standardized prevalence of diabetes in Saudi Arab

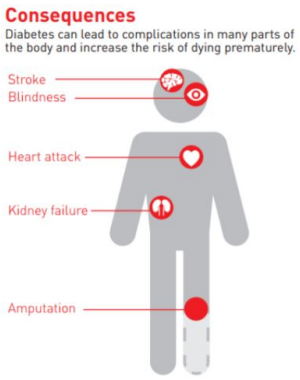


Diabetes Mellitus

Common diabetes complications

- Loss of vision
- End-stage renal disease
- Cardiovascular events
- Lower extremity amputations

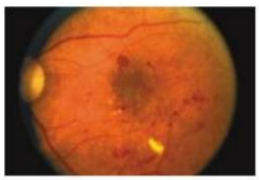
The doctor said: complications are extremely important



1. Loss of vision

- Diabetics are 20 times more likely to develop blindness than non-diabetics
- diabetes is A leading cause of blindness & visual impairment
- Diabetic retinopathy caused 1.9% of moderate or severe visual impairment
globally and 2.6% of blindness in 2010.
- Studies suggest that prevalence of any retinopathy in persons with diabetes is 35% while proliferative (vision threatening) retinopathy is 7%.
- However, retinopathy rates are higher among: people with type 1 diabetes; people with longer duration of diabetes; Caucasian populations; and possibly among people of lower socioeconomic status.

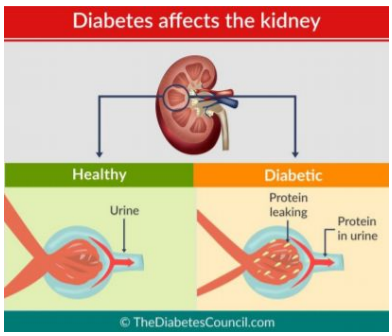
A normal retina.



A retina showing signs of diabetic retinopathy.

2. End-stage renal disease

- Pooled data from 54 countries show that at least 80% (approximately one-third of the cases) of
end-stage renal disease (ESRD) are caused by diabetes , hypertension or a combination of the two.
- The proportion of ESRD attributable to diabetes alone ranges from 12–55%.
- The incidence of ESRD is up to 10 times as high in adults with diabetes as those without.



3. Cardiovascular events

- Diabetes accounts for more than 5% of the global deaths, which are mostly due to CVD
- Adults with diabetes historically have 2-3 times higher rate of cardiovascular disease (CVD) than adults without diabetes.
- The risk of cardiovascular disease increases continuously with rising fasting plasma glucose levels, even before reaching levels sufficient for a diabetes diagnosis.
- Almost 7 in 10 people with diabetes over age 65 will die of some type of heart disease. About 1 in 6 will die of stroke.

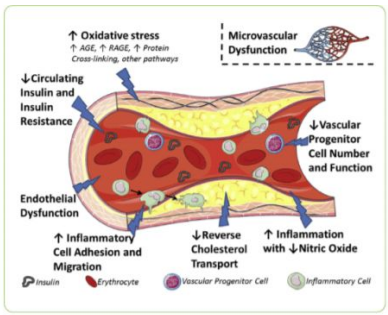
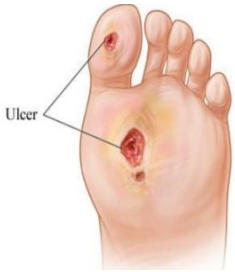


Figure1: Relationships between cardiovascular disease and diabetes.

4. Lower extremity amputations

• Diabetes appears to dramatically increase the risk of lower extremity amputation because of infected, non-healing foot ulcers.
• Rates of amputation in populations with diagnosed diabetes are typically 10 to 20 times those of nondiabetic populations.
• Encouragingly several studies show a 40% to 60% reduction in rates of amputations among adults with diabetes during the past 10–15 years in western countries.



Diabetic patients are in risk of amputation due to the followings:
1- lower immunity.
2- poor blood supply due to damaged or weakened blood vessels.
3-the media is preferable for invaders to grow" high glucose".
4-Neuropathy can contribute also" they do not feel that they have wounds or injury in the extremities"
5-Education of the complications of diabetes is very crucial since diabetes is a silent disease"asymptomatic".

Risk factors

1. Genetic factors

• May play a part in development of all types; autoimmune disease and viral infections may be risk factors in Type I DM.
• Twin studies

Genetics mainly are involved in **type 2 diabetes.**
Genetics are considered as unmodifiable factor.
You cannot do anything as it is genetics unless if you as medical students discover a treatment or an adjustment in the future..

2. 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 (**Anthropometry:** refers to the measurement of the human individual)
(body mass index, waist circumference), and lifestyle (diet, physical activity, smoking) factors.

Risk factors

3. 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 40.0

(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/m2 compared with those with BMI <22 .
- The risk of diabetes associated with body weight appears to be modified by age.

" increased age will lead to increase risk of diabetes"
- Obesity acts at least in part by inducing resistance to insulin mediated peripheral glucose uptake, which is an important component of type 2 diabetes.

4. 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.

5. Physical inactivity , dietary imbalance

- 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.

Risk factors

6. 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
• 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).

7. 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.

8. Infections

• A range of relatively rare infections (viral infections) and illnesses can damage the pancreas and cause type 1 diabetes.

Risk factors

9. Pregnancy	• Pregnancy as predisposing factor causes weight gain and increases levels of estrogen and placental hormones, which antagonize insulin.
10.Medications	• Drugs that are known to antagonize the effects of insulin: • Thiazide diuretics, • Adrenal corticosteroids, • Oral contraceptives.
11.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.
12.Autoimmune disease	• may be risk factors for TIDM
13. patho-physiological changes	• (weight gain insulin resistance and reduction of insulin secretion) may lead to glucose intolerance and diabetes .
14.Life style factors	overfeeding and sedentary life .

Summary

Diabetes mellitus

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.

Main types of diabetes

Type 1
Type 2
Gestational diabetes
Specific types of diabetes due to other causes
Impaired glucose tolerance (IGT) and impaired fasting glycaemia (IFG)
Secondary diabetes
Pre-diabetes

Symptoms

- Increase frequency of Urine (pee)
- Increase thirst
- Weight loss
- Increase appetite
- Blurred vision
- Tingling hands and feet
- Easy fatigability
- Dry skin
- Slow healing wounds

Diagnosis:

- Random plasma glucose
- Fasting plasma glucose
- Oral glucose tolerance test – 2h glucose

Common diabetes complications

- Loss of vision
- End-stage renal disease
- Cardiovascular events
- Lower extremity amputations

Risk factors

1. Genetic factors
2. Family history
3. Obesity
4. Fat distribution
5. Physical inactivity ,dietary imbalance.
6. Diet
7. Smoking
8. Infections
9. Pregnancy
10. Medications
11. Physiologic or emotional stress
12. Autoimmune disease
13. patho-physiological changes

MCQs

Q1: What is the most common form of diabetes worldwide?

A. Type I diabetes

B. Type II diabetes

C. Gestational diabetes

D. Secondary diabetes

Q2: Which of the following is the leading complication of diabetes in Saudi Arabia?

A. Retinopathy

B. Nephropathy

C. Neuropathy

D. Stroke

Q3: Which one of these statement is the best to describe the prevalence of diabetes?

A. Its prevalence is reduced world wide

B. Higher among young age group

C. Higher in developing countries

D. Higher in developed countries

Q4: What is the most common disease in Saudi Arabia?

A. Depressive Disorders

B. Ischemic Heart Disease

C. Atherosclerosis

D. Diabetes

Q5: 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

Q6: 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

Q7: 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

Q8: 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/B 2/A 3/C 4/D 5/D. 6/B. 7/D. 8/C