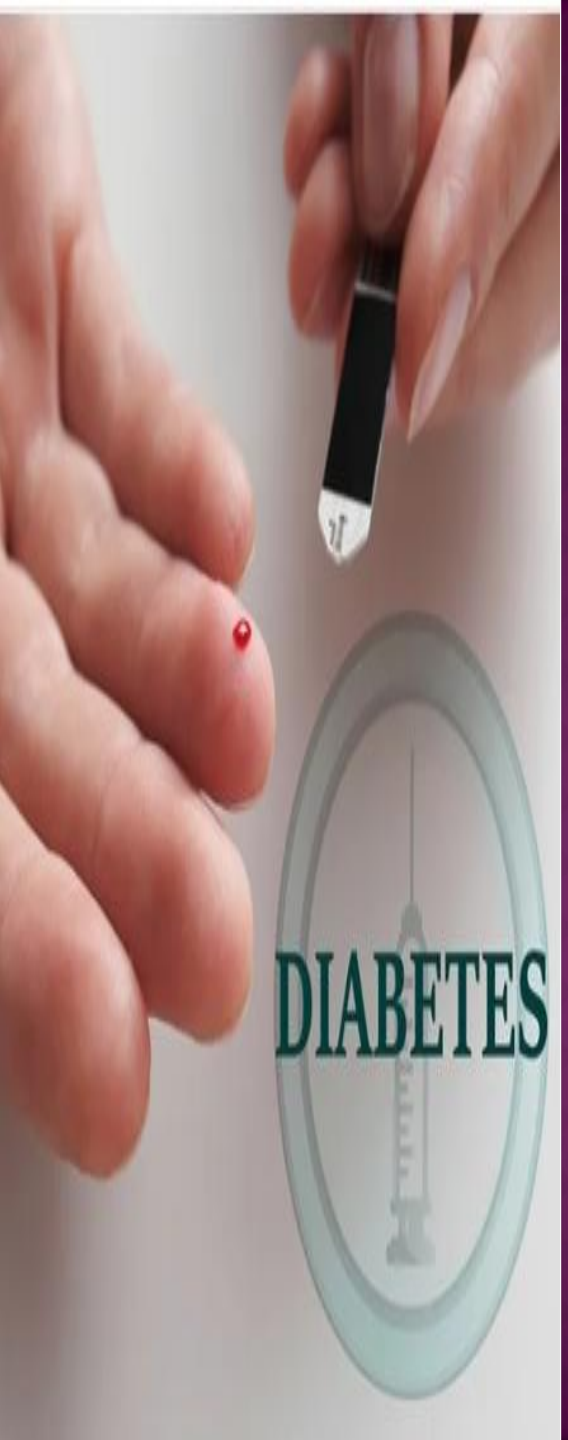


FAMILY AND COMMUNITY MEDICINE

EPIDEMIOLOGY OF DIABETES MELLITUS-2025

DR ALAA A.SALIH FICMS-FM

2025

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

1 in 10 people are living with diabetes

IDF's mission is to improve the lives of people living with diabetes and prevent diabetes in those at risk.

Learn about diabetes

View the latest data

DEFINITION:

It is a heterogeneous group of diseases, characterized by a state of chronic hyperglycemia, resulting from a diversity of aetiologies, environmental and genetic, acting jointly.

The underlying cause of diabetes is defective production or action of insulin, a hormone that controls glucose, fat, and amino acid metabolism.

Characteristically, diabetes is a long-term disease with variable clinical manifestations and progression.

Chronic hyperglycemia, from whatever cause, leads to complications – cardiovascular, renal, neurological, ocular, and others.

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: Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy

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

Type 1 diabetes

- Lack of insulin
- Autoimmune
- Usually children

Type 2 diabetes

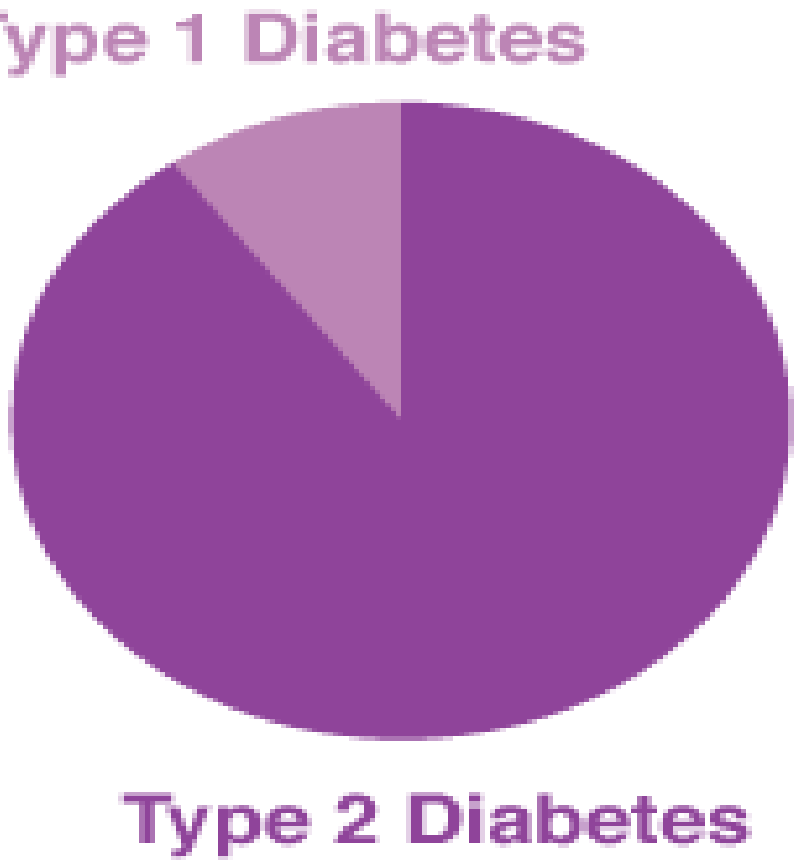
- Insulin resistance
- Lifestyle factors
- Usually adults

Gestational diabetes

- Insulin resistance
- During pregnancy
- Risks to mother and child

90% to 95%

of all diabetes cases are type 2.



DIAGNOSIS

RESULT	FASTING BLOOD GLUCOSE	HbA1C	GLUCOSE TOLERANCE TEST	RANDOM GLUCOSE TEST	POST PRANDIAL {AFTER 2HRS}
Normal	70-99 mg/dl	Below 5.7%	70-140 mg/dl	70-140 mg/dl	70-140 mg/dl
Prediabetes	100-125 mg/dl	5.7%-6.4%	140-199 mg/dl	140-199mg/dl	140-199 mg/dl
Diabetes	126 mg/dl-higher	6.5%-above	200 mg/dl-Above	200 mg/dl-above	200 mg/dl-above

PRE-PATHOGENESIS PHASE	PATHOGENESIS PHASE		
	EARLY PATHOGENESIS	LATE PATHOGENESIS	
 **STAGE OF SUSCEPTIBILITY** **(at risk)** • Genes-autoantibodies(T1DM) • Obesity • High LDL diet • Physical inactivity • Stress, smoking • Health condition; PCOs • Placental hormones	**STAGE OF SUBCLINICAL DISEASE** **PREDIABETES** **(pathological changes)** • Last for months to years • Autoantibodies develop and damage the beta-cells (T1DM) • Typically has no distinct sign or symptom except sole sign of high blood sugar • Hypercholesterolemia, nicotine and stress hormones cause insulin resistance. • Secretion of placental hormones cause insulin resistance in pregnant women(normally beta cells secrete extra insulin to cover up the secretion of placental hormones but in some ladies it can't do so)	**STAGE OF CLINICAL DISEASE** **(clinical manifestations)** **HYPERGLYCEMIA-** • Polyuria • Polyphagia • Polydipsia • Dry mouth • Weight loss • Fatigue • Blurred vision • Slow healing cuts or wounds • Numbness or tingling • Feet swelling	**STAGE OF TERMINATION** • Disease progress to complications; CVD RETINOPATHY-BLINDNESS FOOT DAMAGE-AMPUTATION NEPHROPATHY-CKD HEARING IMPAIREMENT • NO RECOVERY • COMPLICATIONS-ORGAN FAILURE-DEATH
PRIMARY PREVENTION	**SECONDARY PREVENTION**		**TERTIARY PREVENTION**

EPIDEMIOLOGICAL DETERMINANTS

1. AGENT

The underlying cause of diabetes is insulin deficiency which is absolute in type 1 diabetes and partial in type 2 diabetes. This may be due to a wide variety of mechanisms:

(a) Pancreatic disorders - inflammatory, neoplastic and other disorders such as cystic fibrosis.

(b) Defects in the formation of insulin, e.g synthesis of an abnormal, biologically less active insulin molecule.

(c) Destruction of beta cells, e.g., viral infections and chemical agents.

(d) Decreased insulin sensitivity, due to decreased numbers of adipocyte and monocyte insulin receptors.

(e) Genetic defects, e.g., mutation of insulin gene.

(f) Autoimmunity

2. HOST FACTORS

(A) AGE

Although diabetes may occur at any age, surveys indicate that prevalence rises steeply with age.

Type 2 diabetes usually comes to light in the middle years of life and thereafter begins to rise in frequency. Malnutrition-related diabetes affects a large number of young people.

The prognosis is worse in younger diabetics who tend to develop complications earlier than older diabetics.

(B) SEX

In some countries, the overall male-female ratio is about equal.

In south-east Asia, an excess of male diabetics has been observed.

(C) GENETIC *FACTORS:*

- **The genetic nature of diabetes is undisputed.**
- **Twin studies showed that in identical twins who developed type 2 diabetes, concordance was approximately 90 percent; thus, demonstrating a strong genetic component.**
- **In type 1 diabetes, the concordance was only about 50 percent indicating that type 1 diabetes is not totally a genetic entity.**

(D) GENETIC MARKERS

- **Type 1 diabetes is associated with HLA-B8 and B15, and more powerfully with HLA-DR3 and DR4.**
- **The highest risk of type 1 diabetes is carried by individuals with both DR3 and DR4.**
- **On the other hand type 2 diabetes is not HLA-associated.**

(E) IMMUNE MECHANISMS

There is some evidence of both cell-mediated and humoral activity against islet cells.

Some people appear to have defective immunological mechanisms and under the influence of some environmental "trigger", attacks their own insulin-producing cells.

(F) OBESITY

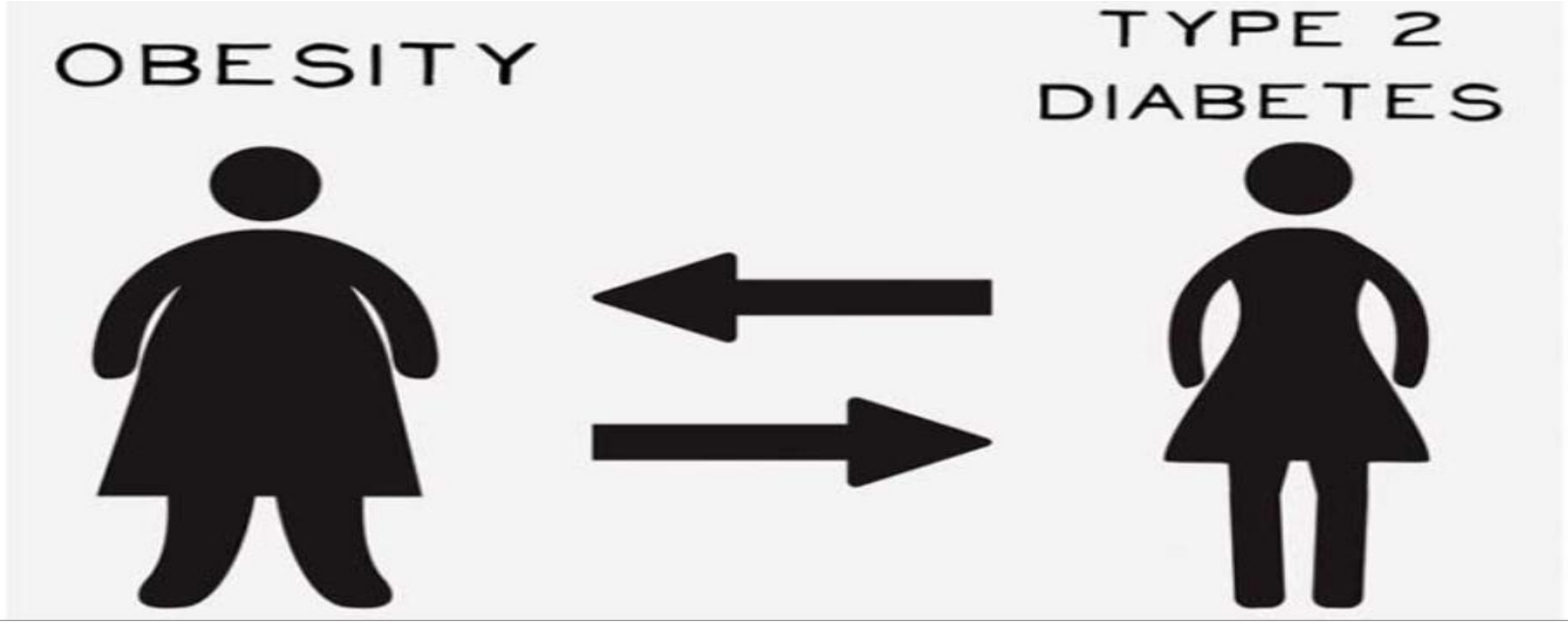
- **Obesity particularly central adiposity has long been accepted as a risk factor for type 2 diabetes and the risk is related to both the duration and degree of obesity.**
- **The association has been repeatedly demonstrated in longitudinal studies in different populations, with a striking gradient of risk apparent with increasing levels of BMI, adult weight gain, waist circumference, or waist-to-hip ratio.**

- **Indeed, waist circumference or waist-to-hip ratio (reflecting abdominal or visceral adiposity) are more powerful determinants of subsequent risk of type 2 diabetes than BMI**
- **Central obesity is also an important determinant of insulin resistance, the underlying abnormality in most cases of type 2 diabetes.**
- **In some instances, obesity reduces the number of insulin receptors on target cells.**

What your Waist-to-Hip Ratio Means

WOMEN	HEALTH RISK	BODY SHAPE
0.80 or below	Low	Pear
0.81 to 0.85	Moderate	Avocado
0.85+	High	Apple

MEN	HEALTH RISK	BODY SHAPE
0.95 or below	Low	Pear
0.96 to 1.0	Moderate	Avocado
1.0+	High	Apple



- **Voluntary weight loss improves insulin sensitivity· and in several randomized controlled trials has been shown to reduce the risk of progression from impaired glucose tolerance to type 2 diabetes.**
- **However, many obese subjects are not diabetic.**
- **Thus, obesity by itself is inadequate to account for all, or even most, cases of type 2 diabetes; physical inactivity and/or deficiencies of specific nutrients may also be involved.**
- **Obesity appears to play no role in type 1 diabetes pathogenesis**

(G)MATERNAL DIABETES

- **Offsprings of diabetic pregnancies including gestational diabetes are often large and heavy at birth, tend to develop obesity in childhood, and are at high risk of developing type 2 diabetes at an early age.**
- **Those born to mothers after they have developed diabetes have a three-fold higher risk of developing diabetes than those born before.**
- **Maternal diabetes associated with intrauterine growth retardation and low birth weight, when associated with rapid growth catch-up later on, appears to increase the risk of subsequent diabetes in the child**

3. ENVIRONMENTAL RISK FACTORS

(A) SEDENTARY LIFESTYLE :

A sedentary lifestyle appears to be an important risk factor for the development of type 2 diabetes.

Lack of exercise may alter the interaction between insulin and its receptors and subsequently lead to type 2 diabetes

(B) DIET

- **A high saturated fat intake has been associated with a higher risk of impaired glucose tolerance, and higher fasting glucose and insulin levels.**
- **Higher proportions of saturated fatty acids in serum lipid or muscle phospholipid have been associated with higher fasting insulin, lower insulin sensitivity, and a higher risk of type 2 diabetes.**

- **Higher unsaturated fatty acids from vegetable sources and polyunsaturated fatty acids have been associated with reduced risk of type 2 diabetes and lower fasting and 2-hour glucose concentrations.**
- **Higher proportions of long-chain polyunsaturated fatty acids in skeletal muscle phospholipids have been associated with increased insulin sensitivity.**

- **In human intervention studies, the replacement of saturated by unsaturated fatty acids leads to improved glucose tolerance and enhanced insulin sensitivity.**
- **long-chain polyunsaturated fatty acids do not appear to confer additional benefits over monounsaturated fatty acids.**
- **When total fat intake is high (greater than 37 percent of total energy), altering the quality of dietary fat appears to have little effect.**

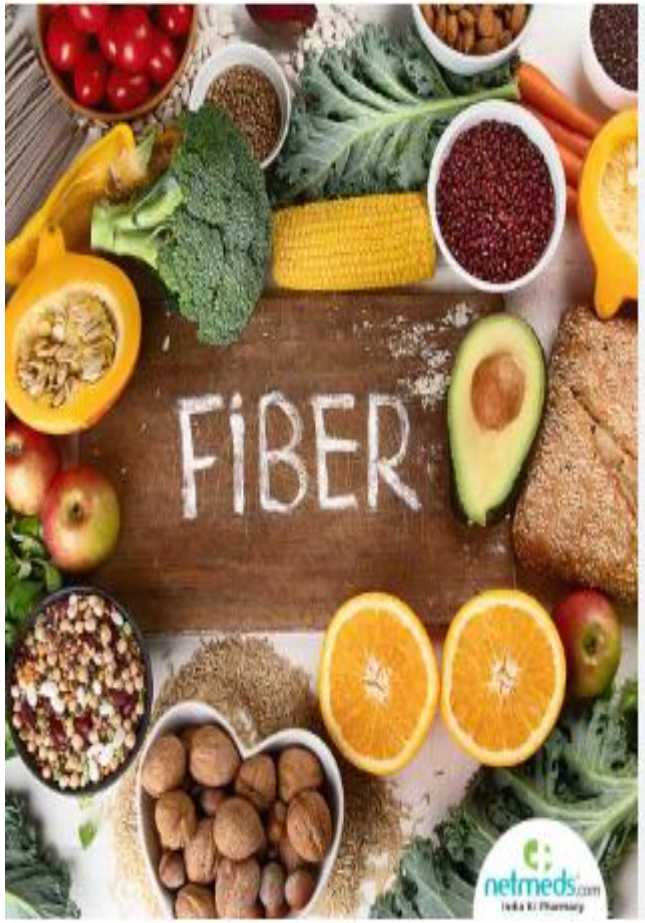
(C) DIETARY *FIBER* :

High intakes of dietary fiber have been shown to result in reduced blood glucose and insulin levels in people with type 2 diabetes and impaired glucose tolerance.

Moreover, an increased intake of whole grain cereals, vegetables and fruits (all rich in NSP) was a feature of diets in randomized controlled trials.

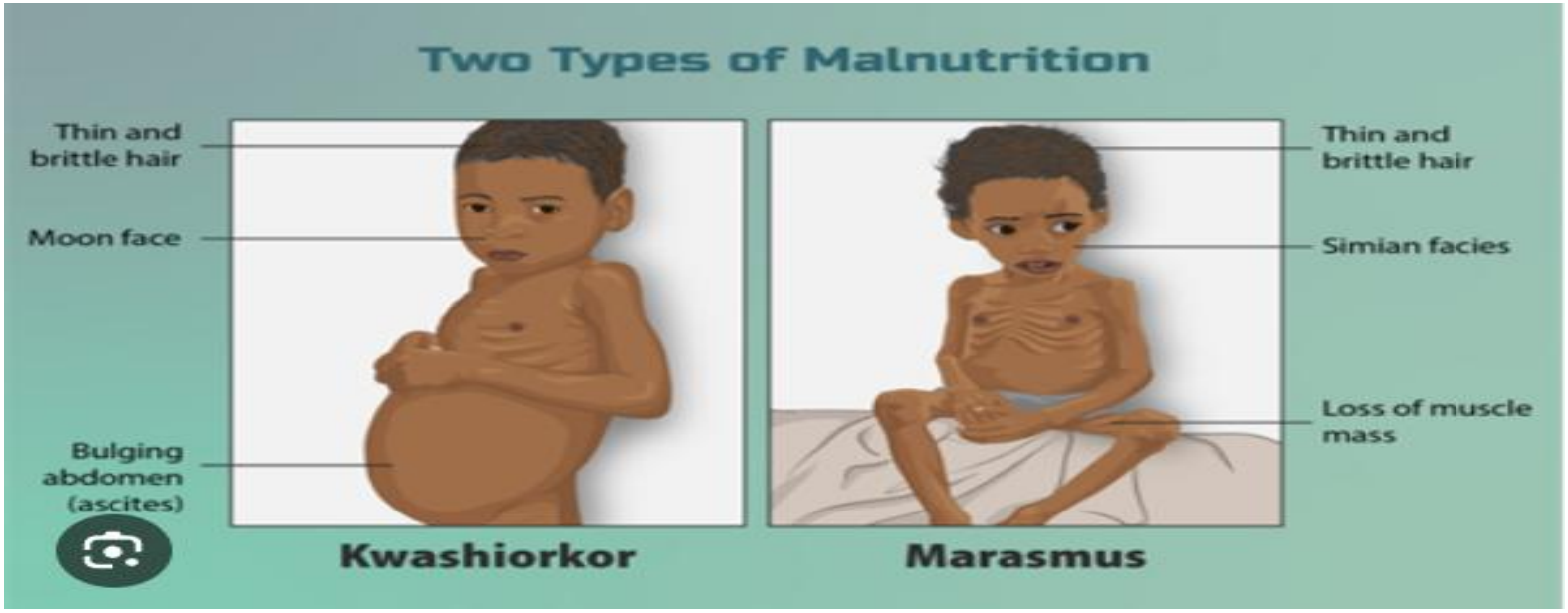
Thus, the evidence for a potential protective effect of dietary fiber appears strong.

A minimum daily intake of 20 grams of dietary fiber is recommended.



(D) MALNUTRITION

- **Protein-energy malnutrition ‘in early infancy and childhood may result in partial failure of ~-cell function.**
- **Damage to beta cells may well explain the associated impaired carbohydrate tolerance in kwashiorkor.**



(E) ALCOHOL

Excessive intake of alcohol can increase the risk of diabetes by damaging the pancreas and liver and by promoting obesity.

(F) VIRAL INFECTIONS:

Among the viruses that have been implicated are rubella, mumps, and human coxsackie virus B4.

Viral infections may trigger in immunogenetically susceptible people a sequence of events resulting in ~-cell destruction.

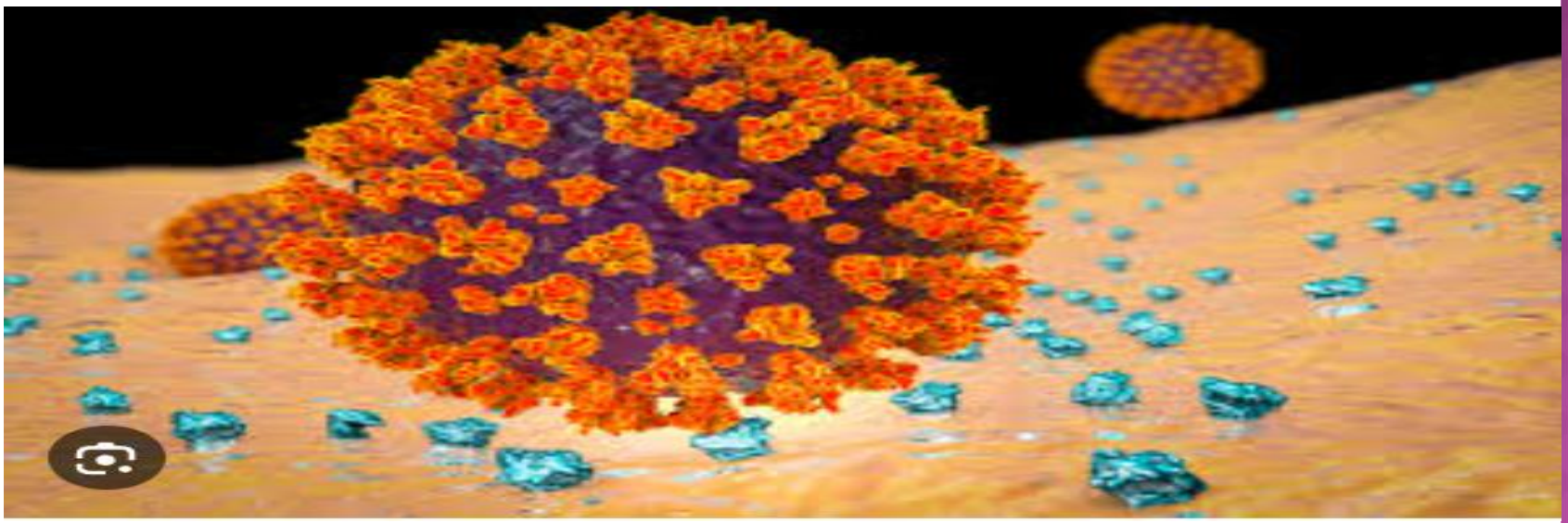


Table 1. Main viruses that might cause T1D and their mechanisms of action

Virus	Effects on cells
Enterovirus	Induction of autoantibodies, induction of β cell lysis, molecular mimicry, stimulation of autoreactive T-cell activity.
Cytomegalovirus	Infection of β cells, clonal activation of T cells, induction in macrophage recruitment to the pancreas.
Rotavirus	Infection of β cells, molecular mimicry.
Rubella virus	Induction of cross-reactions between viral antigens and GAD, which are then subject to T lymphocyte activity infection of β cells.
Mumps virus	Infection of β cells, increased expression of HLA classes I and II in β cells.
Parvovirus	Does not infect β cells, macrophages activate a type Th1 immune response cascade while type Th2 response is attenuated.

(G) CHEMICAL AGENTS

- **Several chemical agents are known to be toxic to beta cells, e.g., alloxan, streptozotocin, the rodenticide VALCOR, etc.**
- **A high intake of cyanide-producing foods (e.g., cassava and certain beans) may also have toxic effects on B-cells.**

(H) STRESS

Surgery, trauma, and stress of situations, internal or external, may "bring out" the disease.

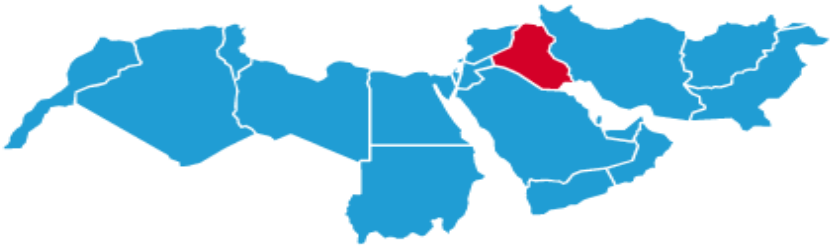
EPIDEMIOLOGICAL DATA

The Diabetes Atlas further breaks down the global prevalence of diabetes according to regions. Here's the global burden as of 2021:

- **North America and the Caribbean**: 51 million
- **Europe**: 61 million
- **Middle East and North Africa:** 73 million
- **Africa:** 24 million
- **South and Central America:** 32 million
- **South East Asia:** 90 million
- **Western Pacific:** 206 million

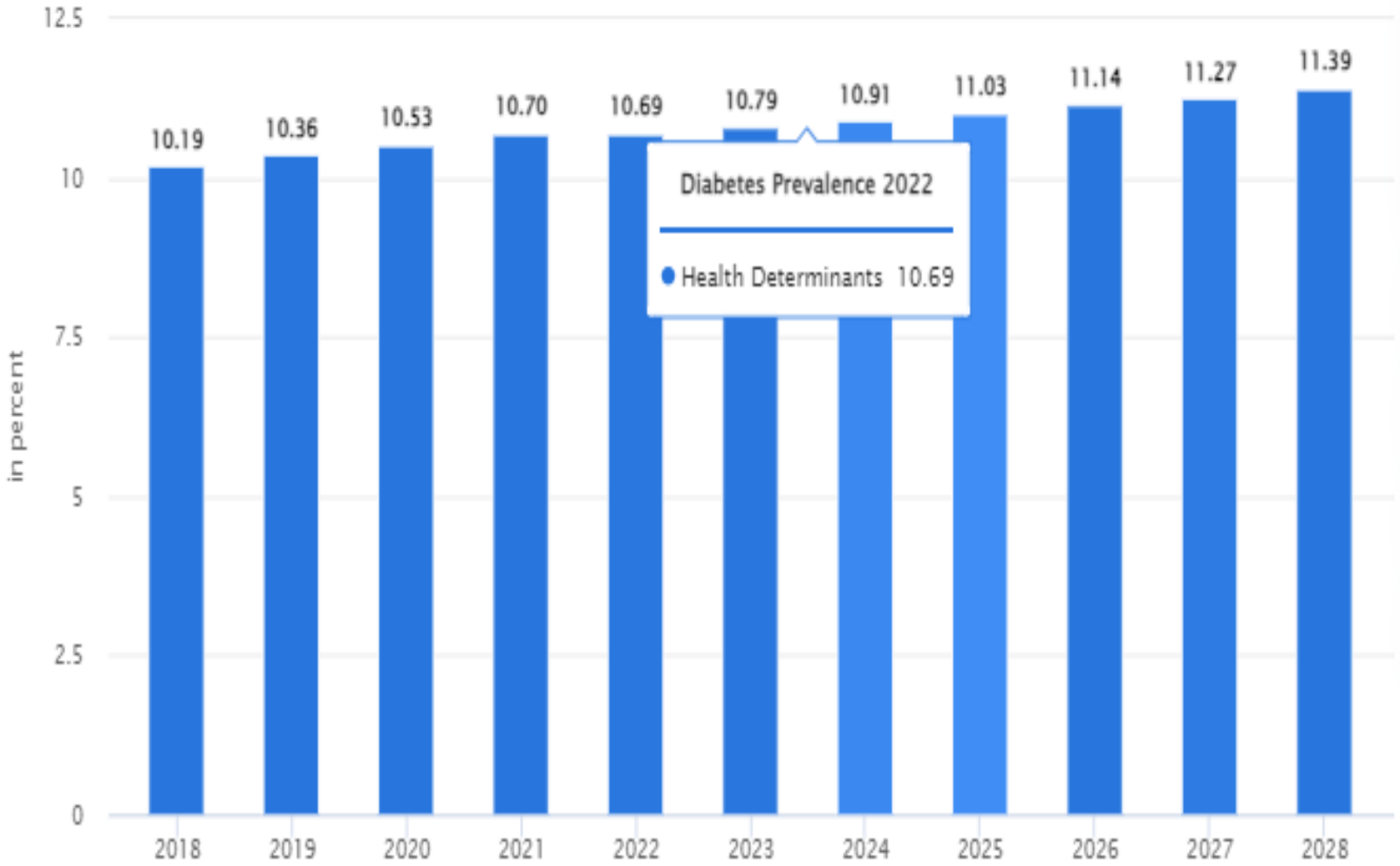
IT WAS EVIDENT THAT LOW AND MIDDLE-INCOME COUNTRIES AND REGIONS HAD THE HIGHEST PREVALENCE OF DIAGNOSED DIABETES. MORE SPECIFICALLY, ABOUT 3 IN 4 ADULTS WITH DIABETES LIVE IN LOW AND MIDDLE-INCOME COUNTRIES.

IRAQ-LAST UPDATE: 2022



Iraq is one of the 21 countries and territories of the IDF MENA (middle east and north Africa).
Total adult population :21,391,100
Prevalence of diabetes in adults :9.4%-10.6%
Total cases of diabetes in adults :2,011,400

DIABETES PREVALENCE



Most recent update: Dec 2023

Sources: Statista Market Insights , World Bank

Iraq

Diabetes report 2000 — 2045

At a glance	2000	2011	2021	2030	2045
Diabetes estimates (20-79 y)					
People with diabetes, in 1,000s	449.9	1,089.0	2,011.4	2,738.7	4,373.8
Age-adjusted comparative prevalence of diabetes, %	-	9.1	10.7	11.6	12.2
People with undiagnosed diabetes, in 1,000s	-	-	946.4	-	-
Proportion of people with undiagnosed diabetes, %	-	-	47.1	-	-

At a glance	2000	2011	2021	2030	2045
Type 1 diabetes estimates in children and adolescents					
New cases of type 1 diabetes (0-14 y), in 1,000s	0.5	-	0.5	-	-
New cases of type 1 diabetes (0-19 y), in 1,000s	-	-	0.7	-	-
Type 1 diabetes (0-14 y), in 1,000s	2.4	-	2.5	-	-
Type 1 diabetes (0-19 y), in 1,000s	-	-	5.0	-	-

Type 1 DM =

AFREZZA® INHALER

Table 2.3–Staging of type 1 diabetes

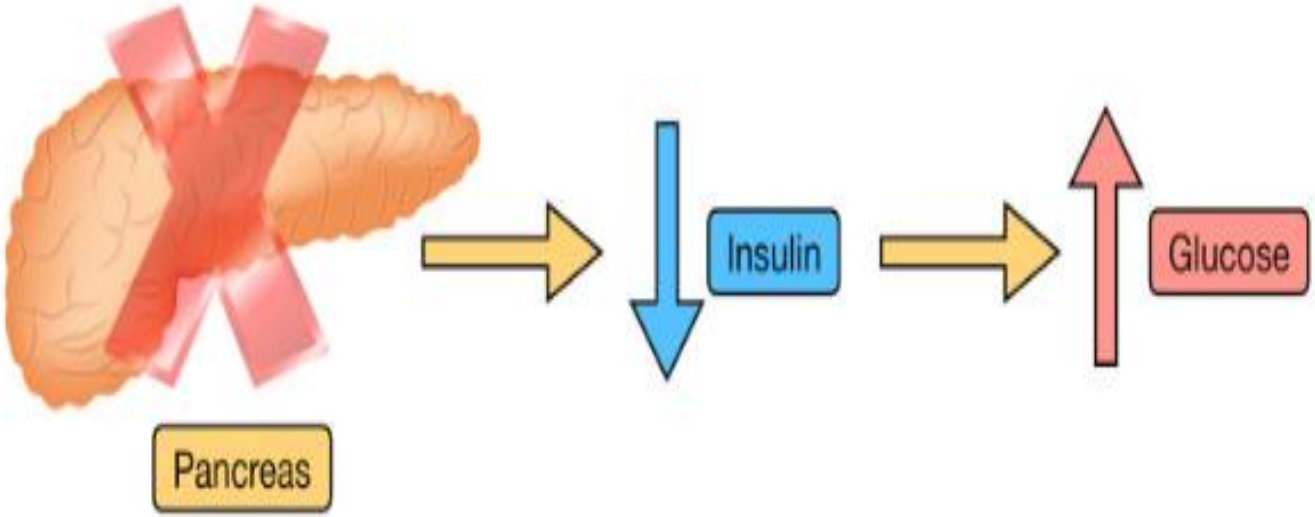
	Stage 1	Stage 2	Stage 3
Characteristics	• Autoimmunity • Normoglycemia • Presymptomatic	• Autoimmunity • Dysglycemia • Presymptomatic	• Autoimmunity • Overt hyperglycemia • Symptomatic
Diagnostic criteria	• Multiple islet autoantibodies • No IGT or IFG	• Islet autoantibodies (usually multiple) • Dysglycemia: IFG and/or IGT • FPG 100–125 mg/dL (5.6–6.9 mmol/L) • 2-h PG 140–199 mg/dL (7.8–11.0 mmol/L) • A1C 5.7–6.4% (39–47 mmol/mol) or ≥10% increase in A1C	• Autoantibodies may become absent • Diabetes by standard criteria

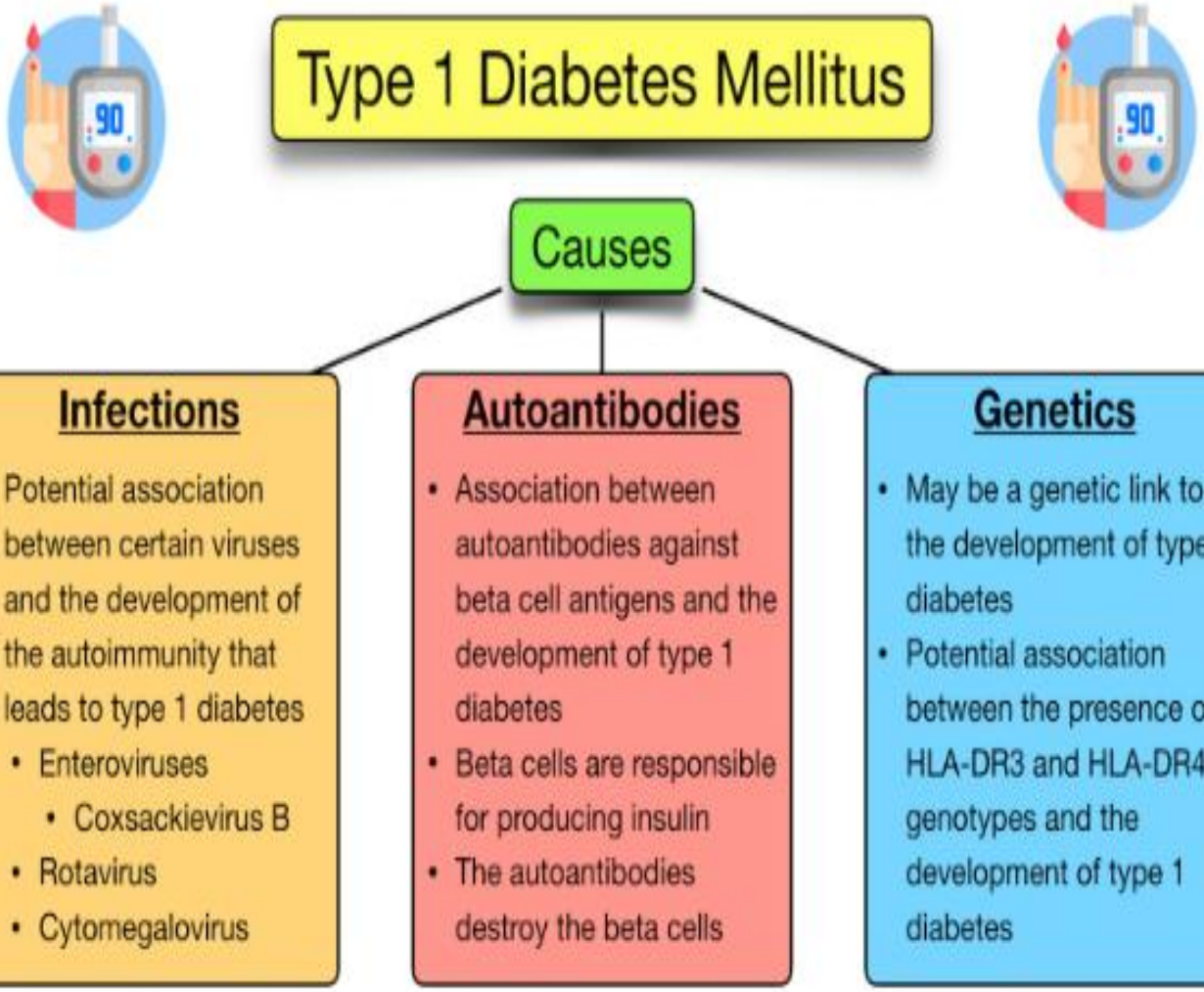
Adapted from Skyler et al. (40). FPG, fasting plasma glucose; IFG, impaired fasting glucose; IGT, impaired glucose tolerance; 2-h PG, 2-h plasma glucose. Alternative additional stage 2 diagnostic criteria of 30-, 60-, or 90-min plasma glucose on oral glucose tolerance test ≥200 mg/dL (≥11.1 mmol/L) and confirmatory testing in those aged ≥18 years have been used in clinical trials (79).

Type 1 Diabetes Mellitus

Definition

Type 1 Diabetes - An autoimmune disease in which the insulin-producing cells of the pancreas are destroyed, leading to high blood glucose levels





Type 1 Diabetes Causes: The pathophysiology and causes of type 1 diabetes include infections, autoantibodies, and genetics.

Type 1 Diabetes Mellitus

Risk Factors

Family History

- Family history of type 1 diabetes increases risk
- Increased risk if parent has type 1 diabetes
  - Even larger risk if both parents have it
- Family history of other autoimmune diseases increases the risk

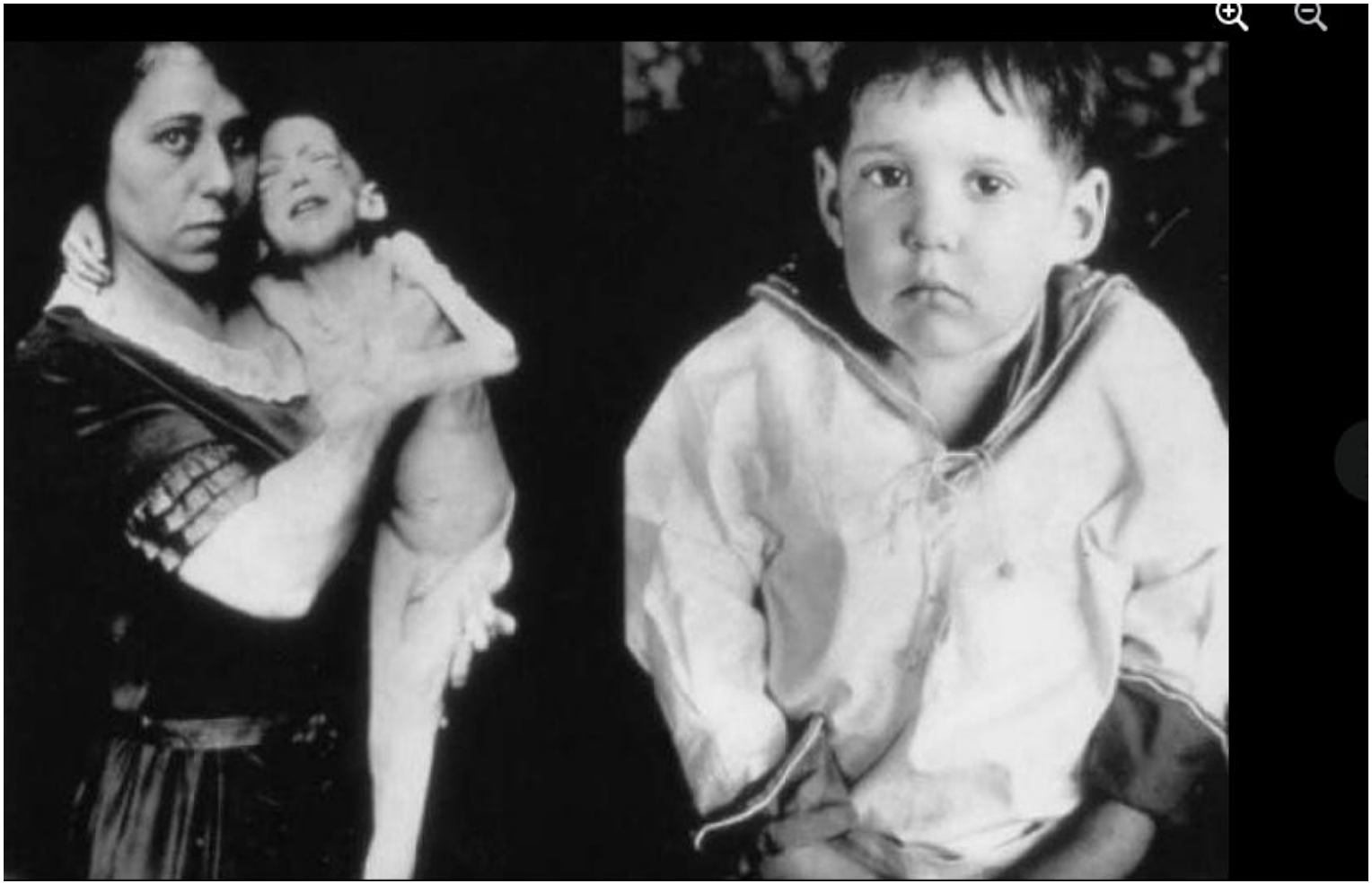
Environmental

- Obesity
- Poorly-diverse gut microbiome
- Diet
  - Breastfeeding possibly decreases risk
  - Early cow's milk possibly increases risk
- Lack of vitamin D

Type 1 Diabetes Risk Factors: Risk factors for developing type 1 diabetes include family history, obesity, diet, lack of vitamin D exposure, etc.

PART 2

EPIDEMIOLOGY OF TYPE 1 DIABETES



Complications of Diabetes Type-1

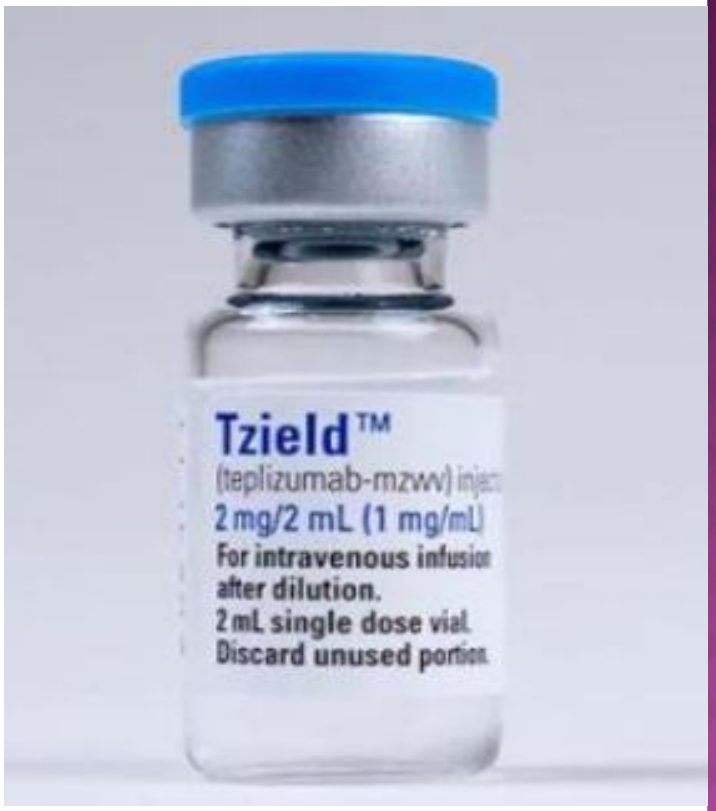
PACE HOSPITALS

Diabetes Mellitus Type-1 complications that can occur over time such as:

- Diabetic neuropathy
- Heart and blood vessel disease
- Diabetic nephropathy
- Diabetic retinopathy
- Skin and mouth infections
- Pregnancy complications
- Diabetic ketoacidosis

TYPE 1 DIABETES PREVENTION

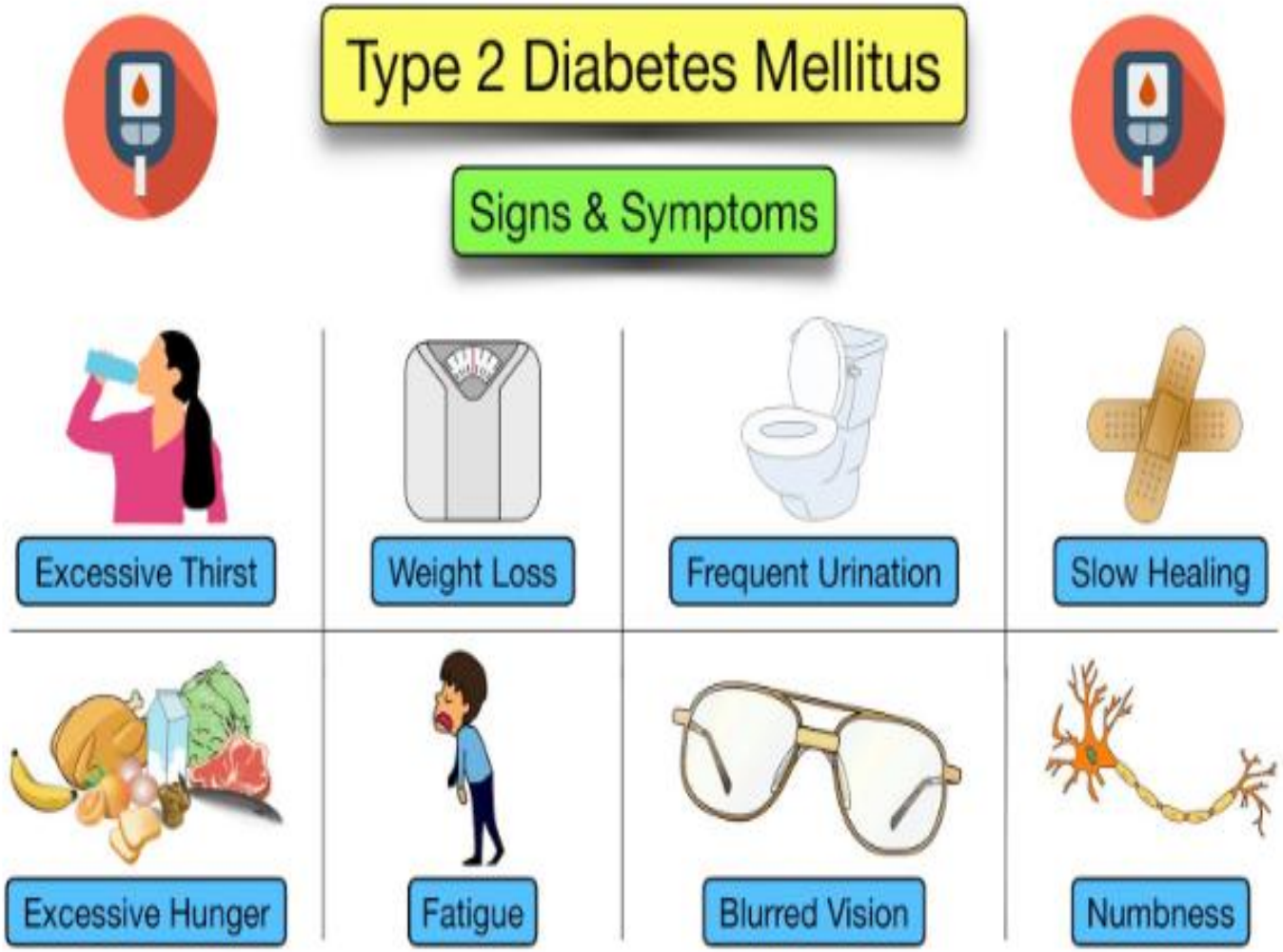
- Monitor people at risk of developing type 1 diabetes.
- Teplizumab is recommended to delay the onset of stage 3
- (symptomatic) type 1 diabetes in people aged 8 years or older
- with preclinical (stage 2) type 1 diabetes.



- Teplizumab, sold under the brand name Tzield, is a humanized anti-CD3 monoclonal antibody that is the first approved treatment indicated to delay the onset of stage 3 type 1 diabetes in people with stage 2 T1D.

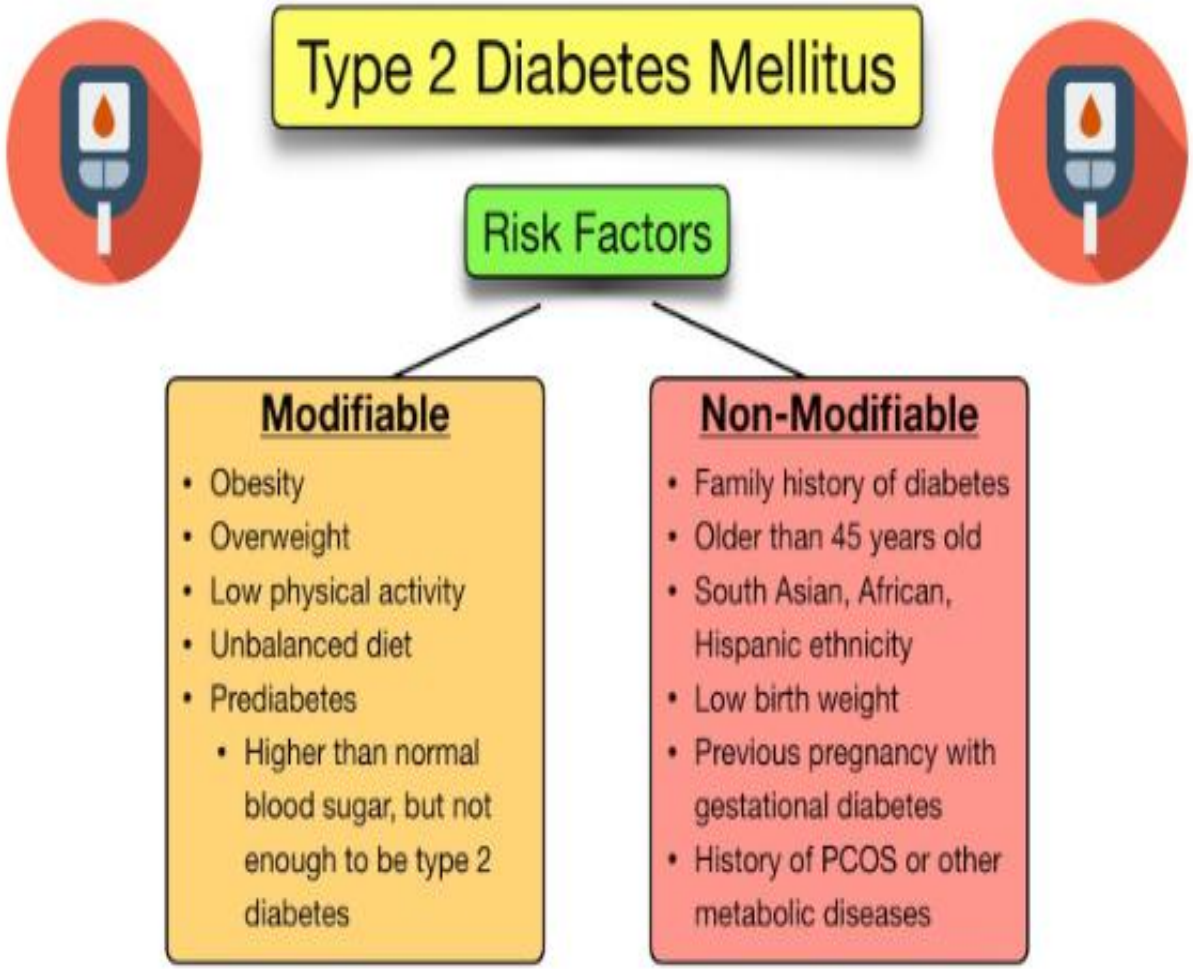
- Each vial of teplizumab 1 mg/1 mL in 2-mL vials costs $13,850, and a 14-day supply of teplizumab costs $193,900

EPIDEMIOLOGY OF TYPE 2 DIABETES



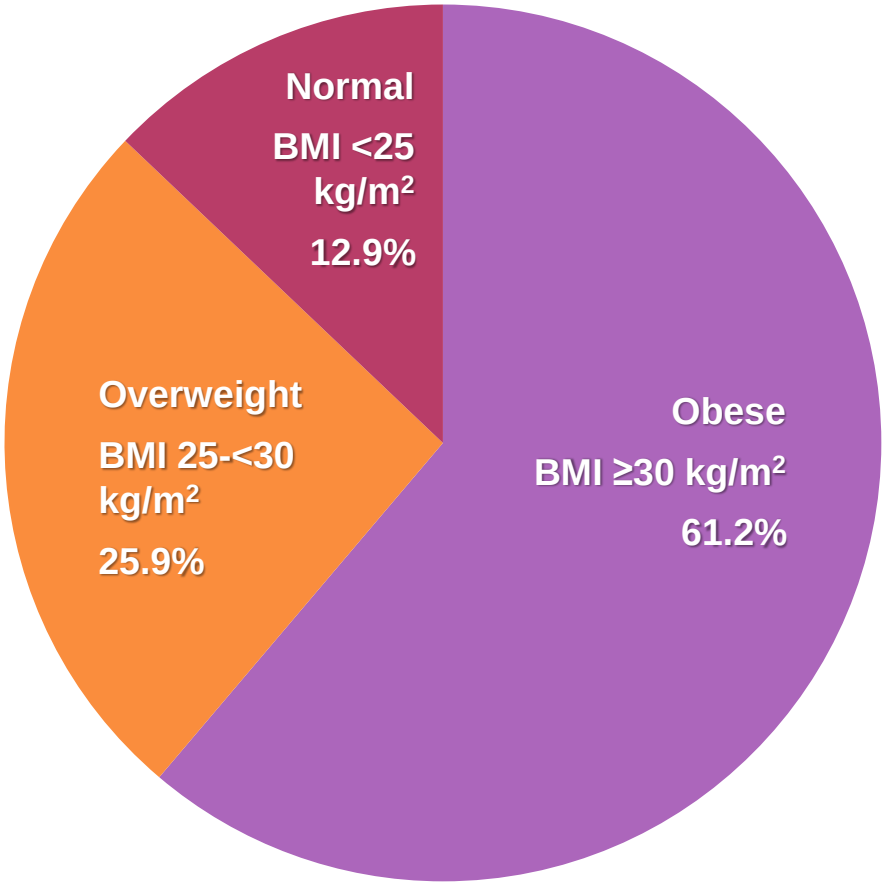
Type 2 Diabetes Symptoms: Signs and symptoms of type 2 diabetes include increased thirst (polydipsia), increased hunger (polyphagia), unexplained weight loss, fatigue, increased urine output (polyuria), blurred vision, numbness, etc.

RISK FACTORS FOR T2DM



Type 2 Diabetes Risk Factors: Risk factors for developing type 2 diabetes include obesity, low physical activity, unbalanced diet, prediabetes, family history, age, ethnicity, gestational diabetes, etc.

PREVALENCE OF OVERWEIGHT AND OBESITY IN DIABETES



IS DIABETES HEREDITARY? HOW YOUR GENES CAN PLAY A ROLE

- It's true that diabetes tends to run in families.
- You may wonder if that means there is a genetic cause to the disorder.
- The answer is complex and depends on the type of diabetes and other factors, such as diet, lifestyle, and environment.
- "For most people who have diabetes, it is not due to a straight genetic group of factors or to environmental ones, but rather it is a combination of both, in fact it is polygenic

IS TYPE 2 DIABETES FAMILIAL?

- Type 2 diabetes does run in families, but not only because family members are related.
- Sometimes it's because they share certain habits that can increase their risk.
- Family history is just one of several risk factors for type 2 diabetes.

3.FAMILY HISTORY

- A positive family history is an important risk factor for T2DM.

Positive Family history

10 %

30 %

(but "obesity gene" not yet identified)

Type 1 Diabetes

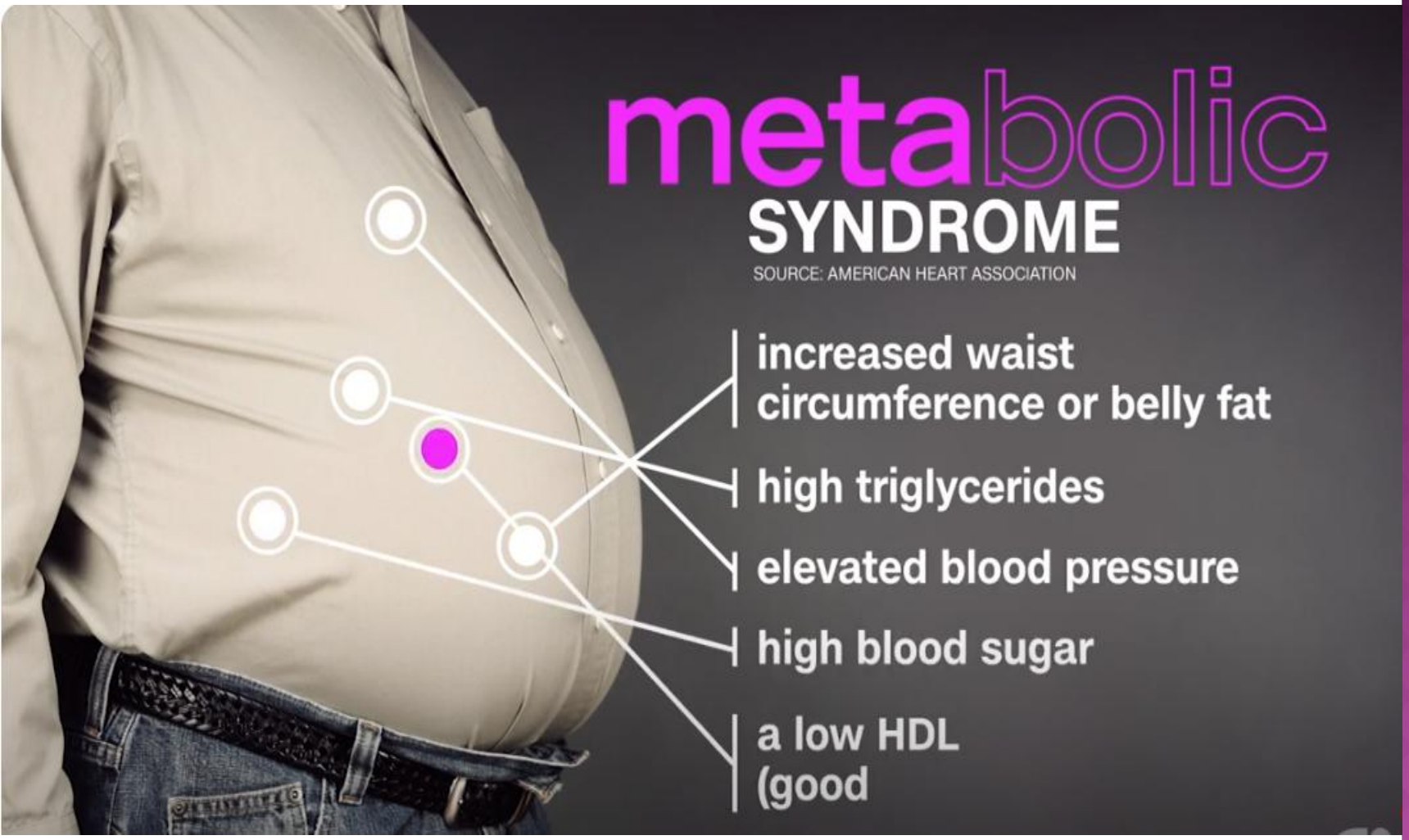
Type 2 Diabetes

Summary of strength of evidence on lifestyle factors and risk of developing type 2 diabetes

Evidence	Decreased risk	Increased risk
Convincing	Voluntary weight loss in overweight and obese people	Overweight and obesity
		Abdominal obesity
	Physical activity	Physical inactivity
		Maternal diabetes[a]
Probable	NSP[1]	Saturated fats
		Intrauterine growth retardation
Possible	η-3 fatty acids	Total fat intake
	Low glycaemic index foods	Trans-fatty acids
	Exclusive breast-feeding[b]	
Insufficient	Vitamin E	Excess alcohol
	Chromium	
	Magnesium	
	Moderate alcohol	

1 NSP = non-starch polysaccharides.
a Includes gestational diabetes.
b As a global public health recommendation, infants should be exclusively breast-fed for the first six months of life to achieve optimal growth, development and health.

METABOLIC SYNDROM-X


metabolic
SYNDROME
SOURCE: AMERICAN HEART ASSOCIATION
increased waist
circumference or belly fat
high triglycerides
elevated blood pressure
high blood sugar
a low HDL
(good

THE METABOLIC SYNDROME
Working definition:

- Glucose intolerance, IGT or DM and /or insulin resistance together with 2 or more of the following:
- Raised arterial BP (>140/90)
- Raised Pl.TG =/> 150 mg/dl and/or low HDL-C (<35mg/dl in males; < 39 mg/dl in females)
- Central obesity waist: hip ratio: Males: >0.9, Females: >0.85
- And /or BMI >30
- Microalbuminurea (>/= 20 ug/min or Albumin/creatinin ratio >/= 30 mg/gm)
- Other components: hyperuricemia, coagulation disorders, raised PAI-1

RISK FACTORS OF METABOLIC SYN.

Age	The prevalence of metabolic syndrome increases with age, affecting less than 10% of people in their 20s and 40% of people in their 60s.
Race	Metabolic syndrome is generally more common among blacks and Mexican-Americans than among Caucasians.
Obesity	A body mass index (BMI) greater than 25 increases your risk of metabolic syndrome and abdominal obesity increase the risk of MS. Abdominal obesity refers to having an apple shape rather than a pear.
History of diabetes	Having a family history of type 2 diabetes or diabetes during pregnancy (gestational diabetes) increases the risk for developing metabolic syndrome.
Other diseases	A diagnosis of hypertension, cardiovascular disease (CVD) or polycystic ovary syndrome (a hormonal disorder in which a woman's body produces an excess of male hormones) also increases the risk for metabolic syndrome.

Table 2.3—Criteria for screening for diabetes or prediabetes in asymptomatic adults

1. Testing should be considered in adults with overweight or obesity (BMI ≥25 kg/m^2 or ≥23 kg/m^2 in Asian Americans) who have one or more of the following risk factors:
   - First-degree relative with diabetes
   - High-risk race/ethnicity (e.g., African American, Latino, Native American, Asian American, Pacific Islander)
   - History of CVD
   - Hypertension (≥140/90 mmHg or on therapy for hypertension)
   - HDL cholesterol level <35 mg/dL (0.90 mmol/L) and/or a triglyceride level >250 mg/dL (2.82 mmol/L)
   - Women with polycystic ovary syndrome
   - Physical inactivity
   - Other clinical conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans)
2. Patients with prediabetes (A1C ≥5.7% [39 mmol/mol], IGT, or IFG) should be tested yearly.
3. Women who were diagnosed with GDM should have lifelong testing at least every 3 years.
4. For all other patients, testing should begin at age 35 years.
5. If results are normal, testing should be repeated at a minimum of 3-year intervals, with consideration of more frequent testing depending on initial results and risk status.
6. People with HIV

CVD, cardiovascular disease; GDM, gestational diabetes mellitus; IFG, impaired fasting glucose; IGT, impaired glucose tolerance.

USE OF A1C FOR SCREENING AND DIAGNOSIS OF DIABETES

The A1C test should be performed using a method that is certified by the National Glycohemoglobin Standardization Program (NGSP) as traceable to the Diabetes Control and Complications Trial (DCCT) reference assay.

ADA 2024

Table 2.4—Risk-based screening for type 2 diabetes or prediabetes in asymptomatic children and adolescents in a clinical setting (254)

Screening should be considered in youth* who have overweight (≥85th percentile) or obesity (≥95th percentile) **A** and who have one or more additional risk factors based on the strength of their association with diabetes:

- Maternal history of diabetes or GDM during the child's gestation **A**
- Family history of type 2 diabetes in first- or second-degree relative **A**
- Race/ethnicity (Native American, African American, Latino, Asian American, Pacific Islander) **A**
- Signs of insulin resistance or conditions associated with insulin resistance (acanthosis nigricans, hypertension, dyslipidemia, polycystic ovary syndrome, or small-for-gestational-age birth weight) **B**

GDM, gestational diabetes mellitus. *After the onset of puberty or after 10 years of age, whichever occurs earlier. If tests are normal, repeat testing at a minimum of 3-year intervals (or more frequently if BMI is increasing or risk factor profile deteriorating) is recommended. Reports of type 2 diabetes before age 10 years exist, and this can be considered with numerous risk factors.

Table 2.7—Screening for and diagnosis of GDM

One-step strategy

Perform a 75-g OGTT, with plasma glucose measurement when an individual is fasting and at 1 and 2 h, at 24–28 weeks of gestation in individuals not previously diagnosed with diabetes.

The OGTT should be performed in the morning after an overnight fast of at least 8 h.

The diagnosis of GDM is made when any of the following plasma glucose values are met or exceeded:

- Fasting: 92 mg/dL (5.1 mmol/L)
- 1 h: 180 mg/dL (10.0 mmol/L)
- 2 h: 153 mg/dL (8.5 mmol/L)

Two-step strategy

Step 1: Perform a 50-g GLT (nonfasting), with plasma glucose measurement at 1 h, at 24–28 weeks of gestation in individuals not previously diagnosed with diabetes.

If the plasma glucose level measured 1 h after the load is ≥130, 135, or 140 mg/dL (7.2, 7.5, or 7.8 mmol/L, respectively),* proceed to a 100-g OGTT.

Step 2: The 100-g OGTT should be performed when the individual is fasting.

The diagnosis of GDM is made when at least two† of the following four plasma glucose levels (measured fasting and at 1, 2, and 3 h during OGTT) are met or exceeded (Carpenter-Coustan criteria [226]):

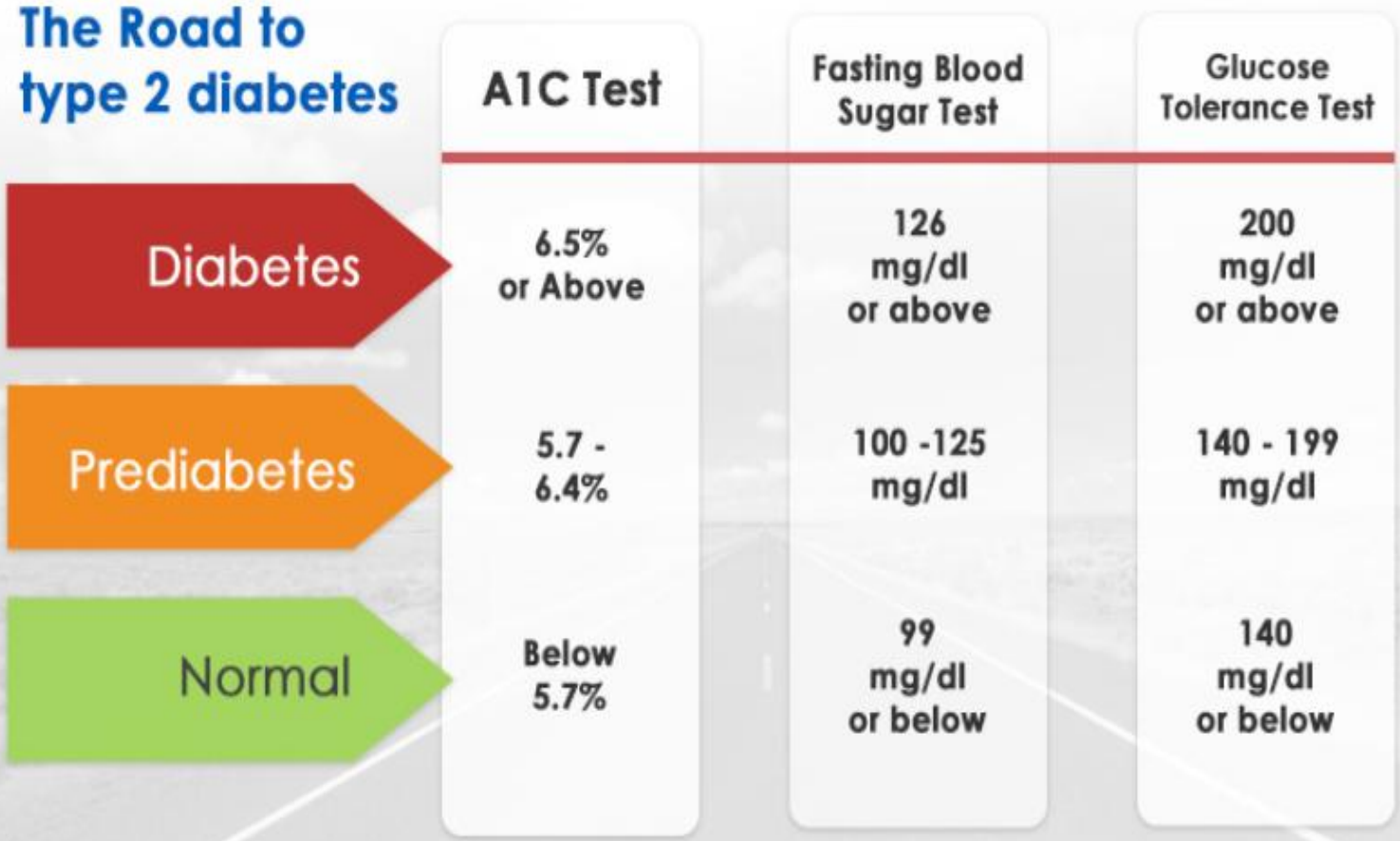
- Fasting: 95 mg/dL (5.3 mmol/L)
- 1 h: 180 mg/dL (10.0 mmol/L)
- 2 h: 155 mg/dL (8.6 mmol/L)
- 3 h: 140 mg/dL (7.8 mmol/L)

GDM, gestational diabetes mellitus; GLT, glucose load test; OGTT, oral glucose tolerance test. *American College of Obstetricians and Gynecologists (ACOG) recommends any of the commonly used thresholds of 130, 135, or 140 mg/dL for the 1-h 50-g GLT (222). †ACOG notes that one elevated value can be used for diagnosis (222).

PREDIABETES

WHAT IS PREDIABETES?

- Prediabetes means your blood sugar level is higher than normal but not high enough to be diagnosed with diabetes. It is a warning sign, signaling a need for lifestyle changes.
- Those with prediabetes typically develop type 2 diabetes within several years and are also at increased risk for serious health problems such as stroke and heart disease.


The Road to type 2 diabetes
A1C Test
Fasting Blood Sugar Test
Glucose Tolerance Test
Diabetes
6.5% or Above
126 mg/dl or above
200 mg/dl or above
Prediabetes
5.7 - 6.4%
100 -125 mg/dl
140 - 199 mg/dl
Normal
Below 5.7%
99 mg/dl or below
140 mg/dl or below

Prediabetes

Prediabetes means your blood sugar level is higher than normal but not high enough to be diagnosed with diabetes. It is a warning sign, signaling a need for lifestyle changes.

More than **1 in 3** adults have prediabetes

9 out of 10 don't know they have prediabetes

Who is at risk?

45+
Over 45 years old


Overweight


Have a parent or sibling with diabetes


Had gestational diabetes


Have high blood pressure


Not physically active

How can I reduce my risk?


Keep a healthy weight


Eat healthy foods


Move more


Quit smoking/tobacco use

For more information, visit parkview.com/diabetes

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

PARKVIEW

PREVENTION OR DELAY OF DIABETES AND ASSOCIATED COMORBIDITIES 2024-ADA

OVERALL RECOMMENDATIONS

- In people with prediabetes, monitor for the development of type 2 diabetes at least annually.
- In people with preclinical type 1 diabetes, monitor for disease progression using A1C approximately every 6 months and 75-g oral glucose tolerance test (i.e., fasting and 2-h plasma glucose) annually.

(POSSIBLE TEPLIZUMAB??)

LIFESTYLE BEHAVIOR CHANGE FOR DIABETES PREVENTION

- Refer adults with overweight/obesity at high risk of type 2 diabetes, as typified by the Diabetes Prevention Program (DPP), to an intensive lifestyle behavior change program to achieve and maintain a weight reduction of at least 7% of initial body weight through healthy reduced-calorie diet and 150 min/week of moderate intensity physical activity.
- A variety of eating patterns can be considered to prevent diabetes in individuals with prediabetes.

PHARMACOLOGIC INTERVENTIONS

- Metformin therapy for the prevention of type 2 diabetes should be considered in adults at high risk of type 2 diabetes, especially those aged
- 25– 59 years with
- BMI 35 kg/m2
- FBS=110 mg/Dl (PREDIABETES)
- Higher and A1C (PREDIABETES)
- Gestational diabetes

Long-term use of metformin may be associated with biochemical vitamin B12 deficiency;

consider periodic measurement of vitamin B12 levels in metformin- treated individuals, especially in those with anemia or peripheral neuropathy.

PREVENTION OF VASCULAR DISEASE AND MORTALITY

Statin therapy may increase the risk of type 2 diabetes in people at high risk of developing type 2 diabetes.

In such individuals, glucose status should be monitored regularly .

It is not recommended that statins be discontinued

In people with a history of stroke and evidence of insulin resistance and prediabetes,

pioglitazone may be considered to lower the risk of stroke or myocardial infarction.

However, this benefit needs to be balanced

with the increased risk of weight gain, edema, and fracture.

A Lower doses may reduce the risk of adverse effects.

LEVEL	RISK FACTORS	DISEASE	COMPLICATIONS	MODE OF INTERVENTIONS
PRIMORDIAL To keep body healthy, prevent body from occurrence of risk factors.	Absent	Absent	Absent	**INDIVIDUAL AND MASS EDUCATION** • Educate to maintain normal body weight. • Adoption of healthy nutritional habits and physical exercise. • Childhood obesity prevention through education. • Educate to maintain a nutritious diet. • Girls in reproductive age or even in childhood maintain weight, take appropriate nutrition, and be physically active.

LEVEL	RISK FACTORS	DISEASE	COMPLICATIONS	MODE OF INTERVENTIONS
PRIMARY To prevent the disease from occurrence by overcoming the risk factors.	Present	Absent	Absent	❖ **HEALTH PROMOTION** • Avoid sedentary behavior. • Be physically active. • Eat healthy and balanced diet; low saturated fats , a low added sugars and high fiber diet. ❖ **SPECIFIC PROTECTION** • Aerobic exercises results in weight loss. • Quit smoking. • Immunomodulation to delay the occurrence of T1DM.

LEVEL	RISK FACTORS	DISEASE	COMPLICATION	MODE OF INTERVENTIONS
SECONDARY To prevent the further progression of disease and prevention of diabetic complications.	Present	Present	Absent	❖ **EARLY DIAGNOSIS** • Classic signs of hyperglycemia; high sugar level, increase thirst, increase hunger, dehydration and so on. • Fasting plasma glucose test • Oral glucose tolerance test • HbA1C ❖ **TREATMENT** • Administer insulin • Lifestyle changes. • Adjusting diet and staying active • Monitoring and maintaining glucose levels • Manage high blood pressure • Treat dyslipidemia • Smoking cessation

LEVEL	RISK FACTORS	DISEASE	COMPLICATION	MODE OF INTERVENTIONS
SECONDARY	Present	Present	Absent	• Medications; metformin • Recognition of symptoms associated with hypoglycemia. • Attending periodic checkups. • Routine checking of blood sugar, of urine for proteins and ketones, of blood pressure, visual acuity and weight should be done . • The foot should be examine for any defective blood circulation , loss of sensation and the health of the skin.

LEVEL	RISK FACTOR	DISEASE	COMPLICATION	MODE OF INTERVENTIONS
TERTIARY Prevent the worsening of complications and rehab patient.	Present	Present	Present	❖ **COMPLICATIONS LIMITATIONS:** • Screening of patients with diabetes for diabetic retinopathy to prevent progression to blindness through prompt treatment • Prevent recurrence or further complications through appropriate medication. • Appropriate diabetic foot care to avoid further damage or foot complications or to preventing from spreading further; wear appropriate shoes, never go barefoot, keep toenails trimmed. • CVD patients take high HDL, low LDL, high fiber diet, 30 minutes brisk walk.

LEVEL	RISK FACTOR	DISEASE	COMPLICATION	MODE OF INTERVENTIONS
TERTIARY	Present	Present	Present	• People, especially older ones, with diabetic complications such as autonomic neuropathy, cardiovascular disease should avoid exercising outdoors on very hot and humid days. ❖ **REHABILITATION:** • Follow-up to ensure adherence to medication regimen, monitor changes, and assist them in maintaining independence in daily life. • Participate in social gathering. • Attain glycemic control. • Patient education is important to help people with diabetes enhance self care. • Psychological support • Exercises • Other behavior modifications(physically active, healthy diet, smoking cessation)

REFERRENCES

- **Park,s Text Book Of Preventive And Social Medicine 23rd Edition**
- https://idf.org/our-network/regions-and-members/middle-east-and-north-africa/members/iraq/
- https://diabetesatlas.org/atlas-presentation/

THANK YOU