

Webinar training contents:

- Introduction
- From Guidelines To Practice
- Principles Of Healthy Diet
- Dietary Advice And Practice
- Q & A

DIABETES

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Epidemiology of diabetes: the global burden

Number of adults (20–79 years) with diabetes worldwide

North America & Caribbean

2045	63 million	↑ 33% increase
2030	56 million	
2019	48 million	

South & Central America

2045	49 million	↑ 55% increase
2030	40 million	
2019	32 million	

Africa

2045	47 million	↑ 143% increase
2030	29 million	
2019	19 million	

Middle East & North Africa

2045	108 million	↑ 96% increase
2030	76 million	
2019	55 million	

South-East Asia

2045	153 million	↑ 74% increase
2030	115 million	
2019	88 million	

WORLD

2045	700 million	↑ 51% increase
2030	578 million	
2019	463 million	

Europe

2045	68 million	↑ 15% increase
2030	66 million	
2019	59 million	

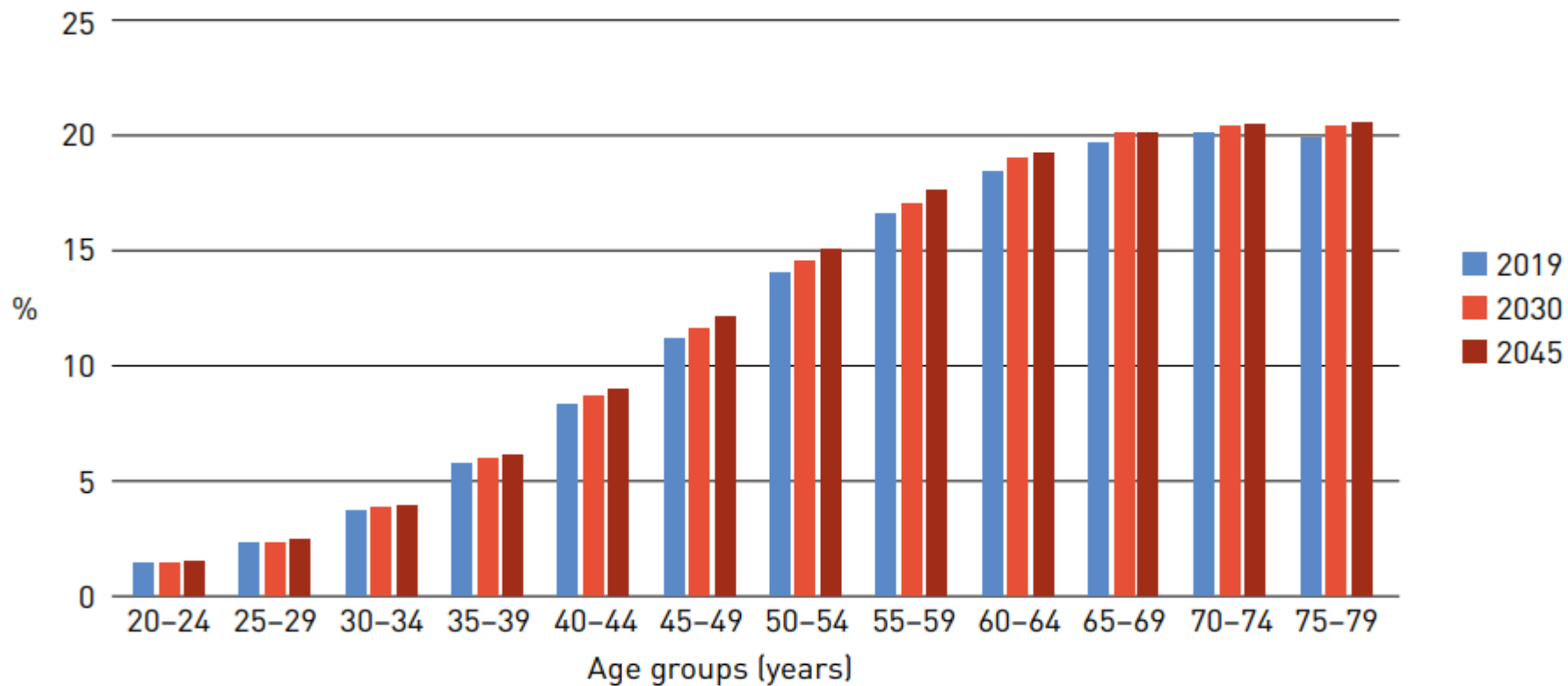
Western Pacific

2045	212 million	↑ 31% increase
2030	197 million	
2019	163 million	

IDF, Diabetes Atlas, Ninth Edition 2019

Epidemiology of diabetes: the global burden

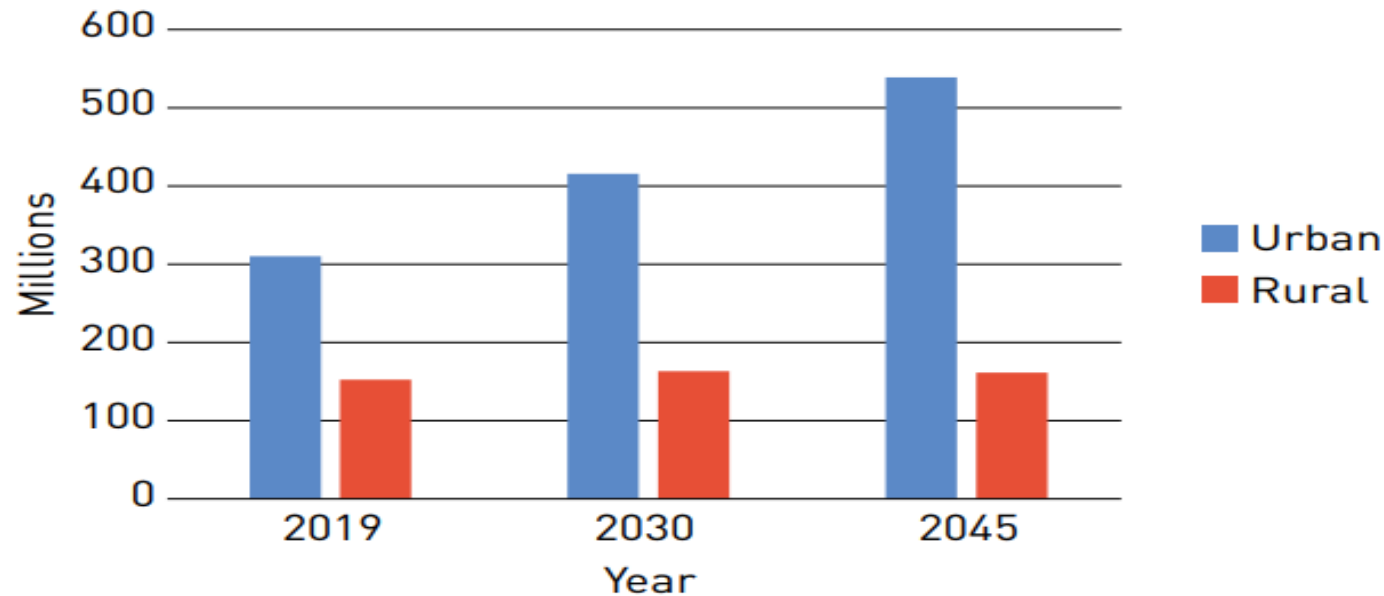
Prevalence of diabetes by age group in adults (20–79 years) in 2019, 2030 and 2045



IDF, Diabetes Atlas, Ninth Edition 2019

Epidemiology of diabetes: the global burden

**Number of people with
diabetes (20–79 years) living in
urban and rural areas in 2019,
2030 and 2045**

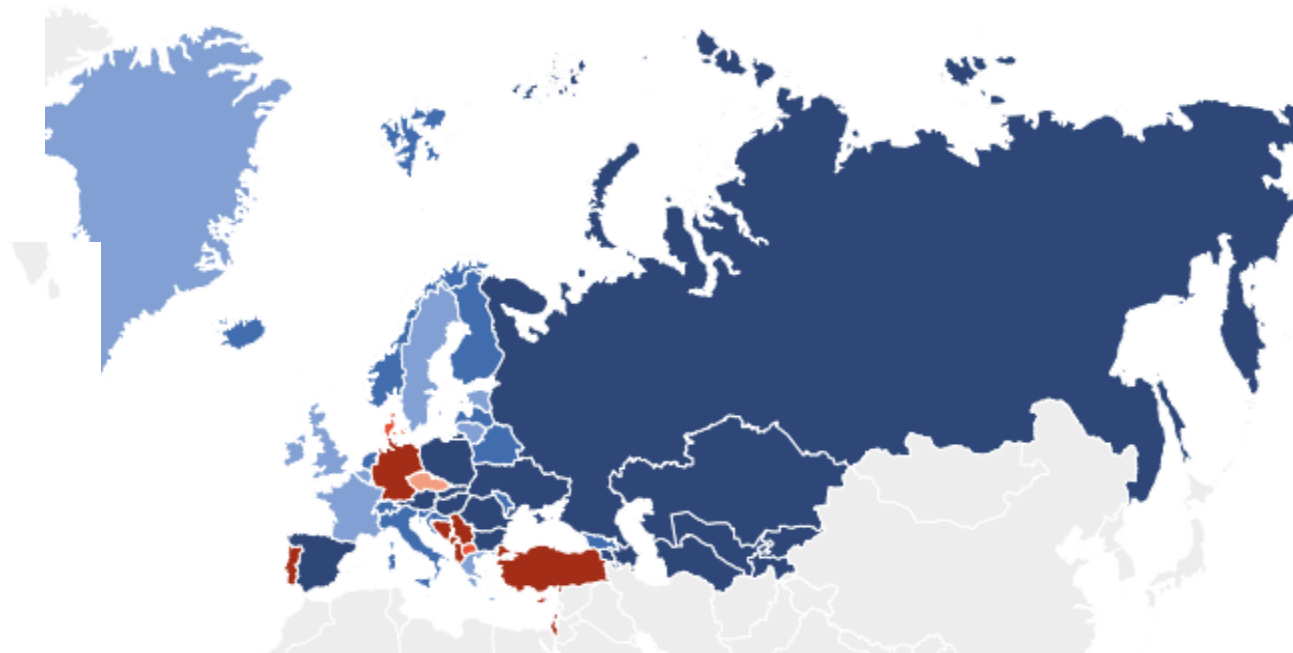


Diabetes Atlas, Ninth Edition 2019

Epidemiology of diabetes

EUROPE

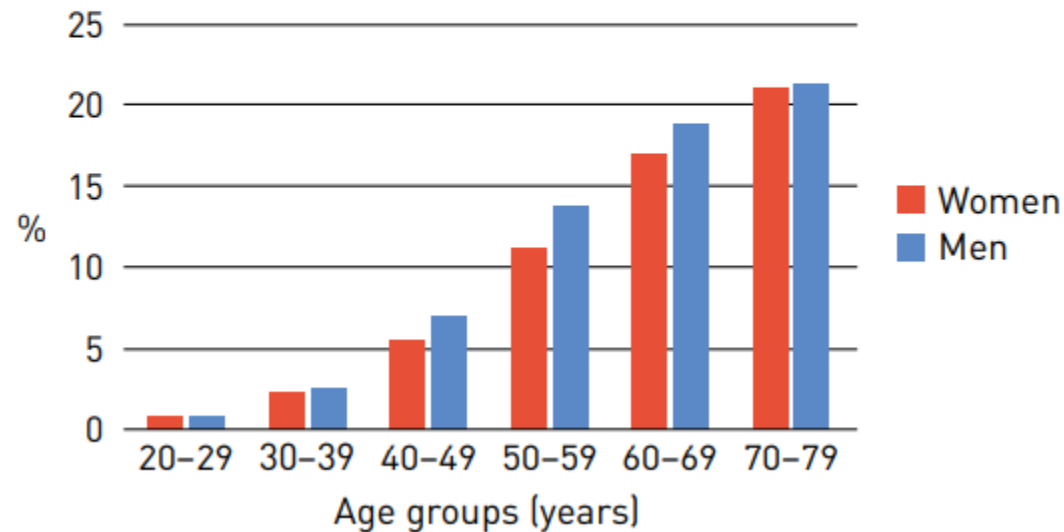
Age-adjusted comparative prevalence
(%) of diabetes (20–79 years) in IDF
Europe Region, 2019



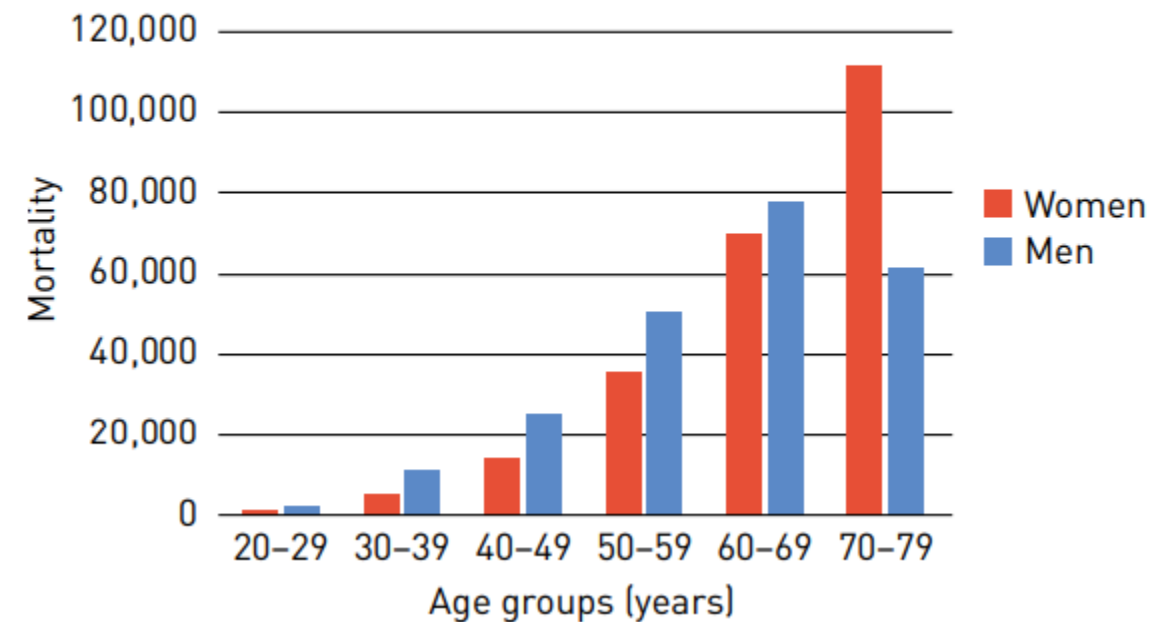
IDF, Diabetes Atlas, Ninth Edition 2019

Epidemiology of diabetes

Prevalence (%) estimates of diabetes by age and sex, IDF Europe Region, 2019




Mortality due to diabetes by age and sex, IDF Europe Region, 2019



IDF, Diabetes Atlas, Ninth Edition 2019

Definition of diabetes

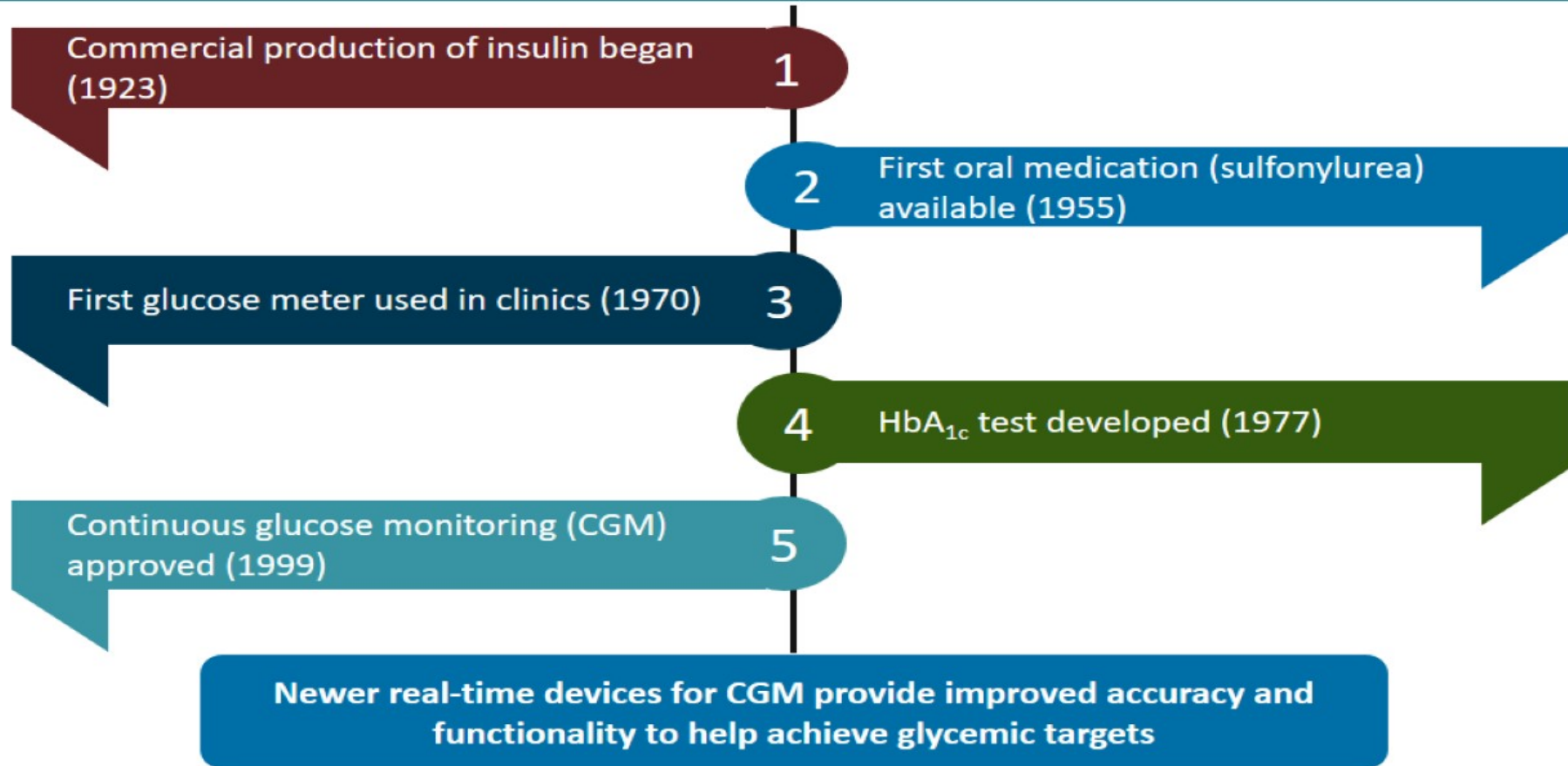


Definition

Diabetes mellitus (DM) is 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

World Health Organization, 1999

Evolution in Diabetes Care Over the Years



ADA website. Timeline. 2020.

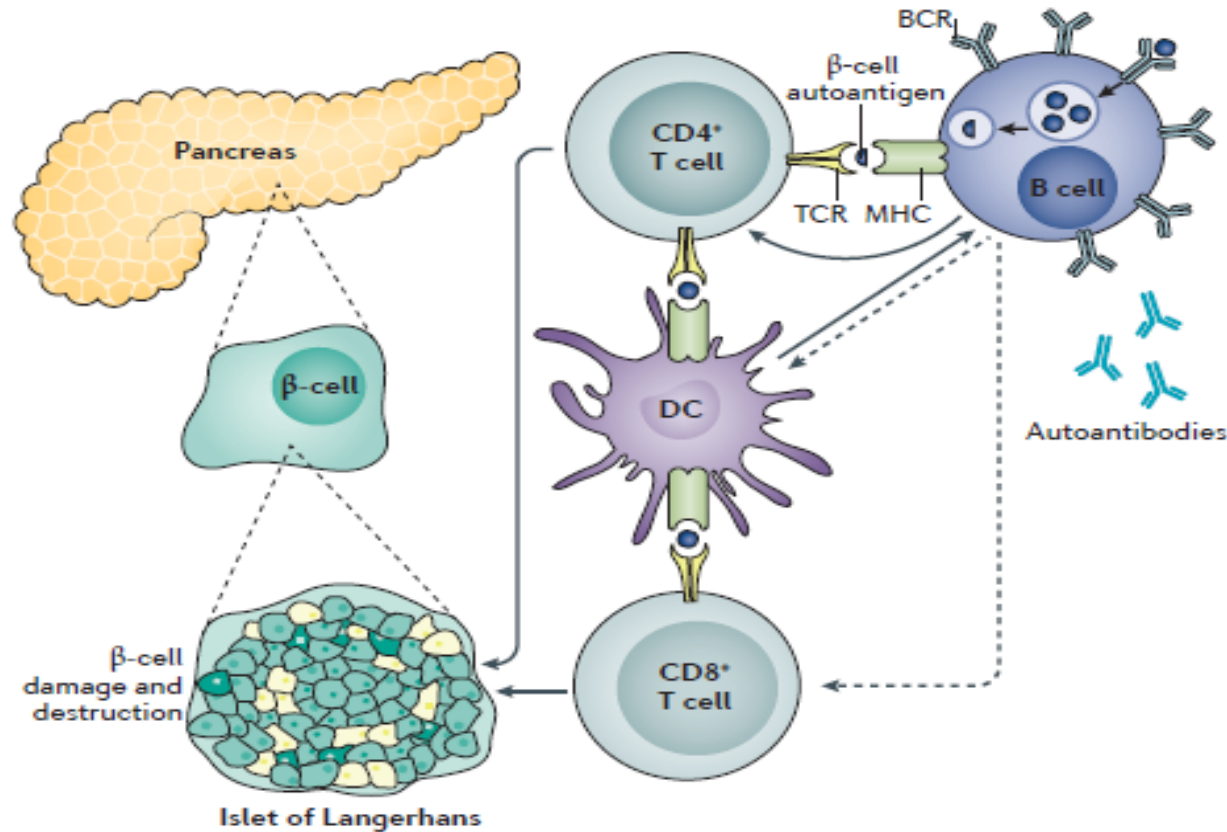
Classification of diabetes

- ☐ Type 1 diabetes (due to autoimmune b-cell destruction, usually leading to absolute insulin deficiency, including latent autoimmune diabetes of adulthood).
- ☐ Type 2 diabetes (due to a progressive loss of adequate b-cell insulin secretion frequently on the background of insulin resistance).
- ☐ Specific types of diabetes due to other causes:
 - ✓ monogenic diabetes syndromes (such as neonatal diabetes and maturity-onset diabetes of the young)
 - ✓ diseases of the exocrine pancreas (such as cystic fibrosis and pancreatitis) or pancreatectomy
 - ✓ endocrinopathies (Cushing's disease, pheochromocytoma, acromegaly)
 - ✓ drug- or chemical-induced diabetes (such as with glucocorticoid use, in the treatment of HIV/AIDS, or after organ transplantation).
- ☐ Gestational diabetes mellitus (diabetes diagnosed in the second or third trimester of pregnancy that was not clearly overt diabetes prior to gestation).

Diabetes Care Volume 44, Supplement 1, 2021 S15

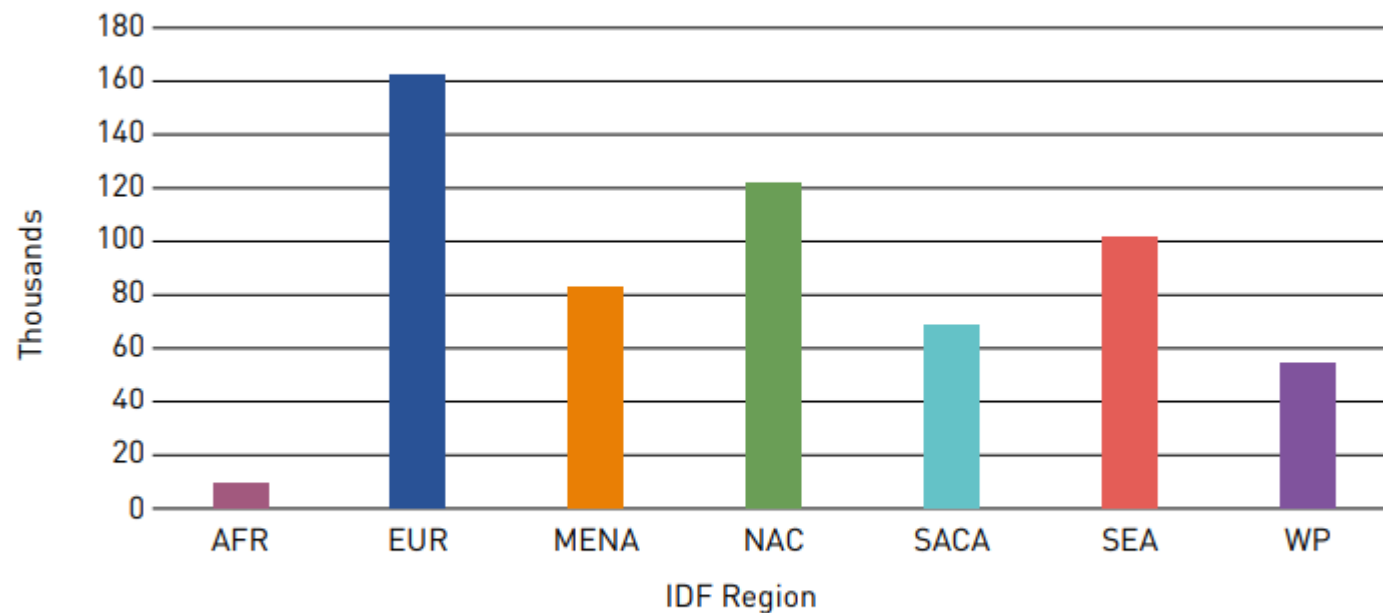
Diabetes type 1

ETIOLOGY



Diabetes type 1

Estimated number of children and adolescents (0–14 years) with prevalent (existing) type 1 diabetes by IDF Region in 2019 (adjusted for mortality)

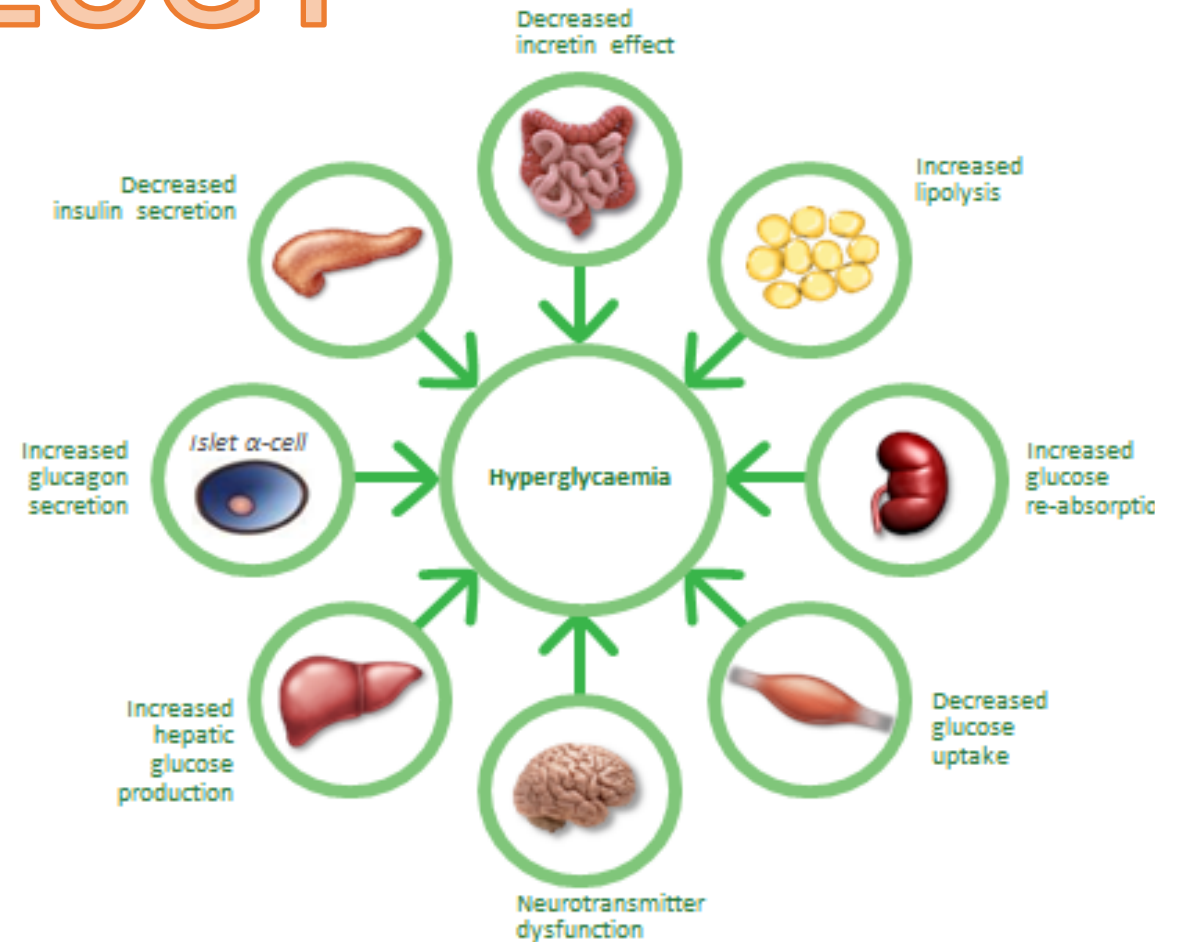
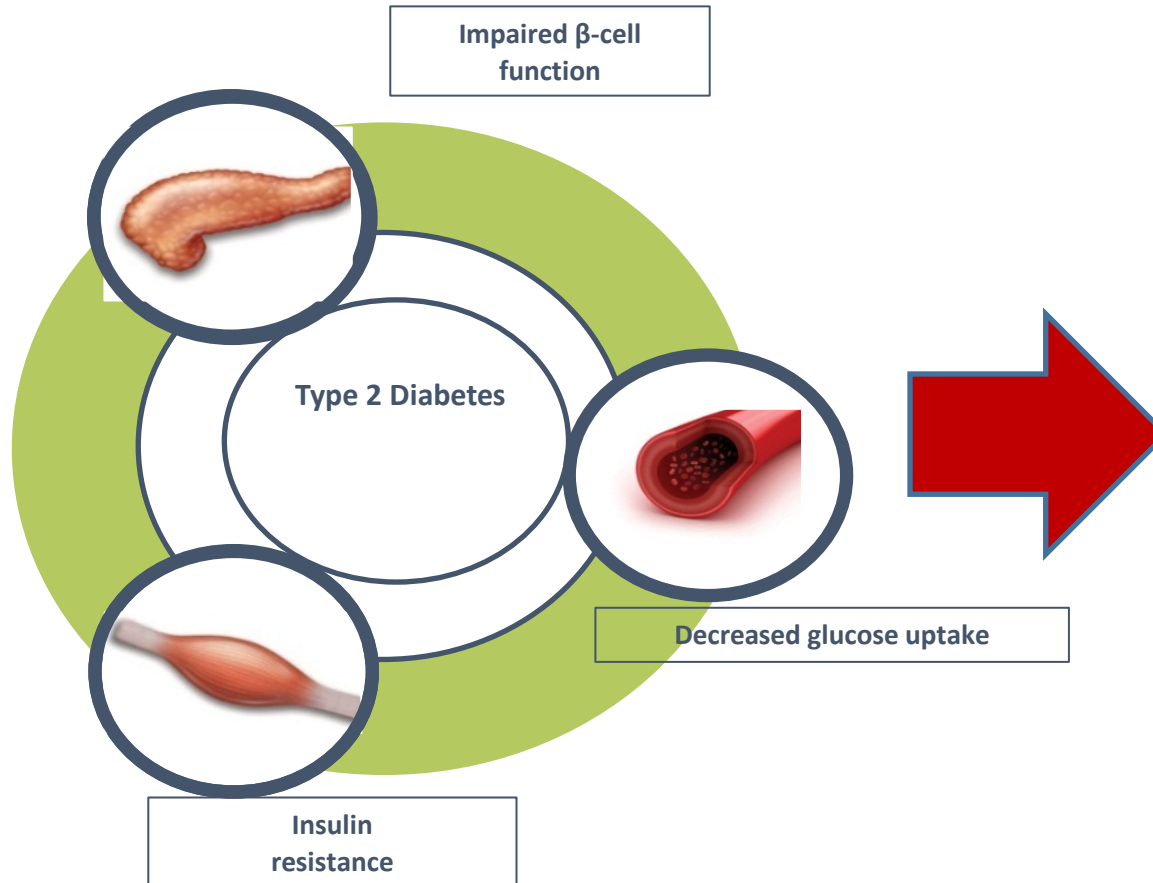


IDF: International Diabetes Federation; AFR: Africa; EUR: Europe; MENA: Middle East and North Africa; NAC: North America and Caribbean; SACA: South and Central America; SEA: South-East Asia; WP: Western Pacific.

IDF, Diabetes Atlas, Ninth Edition 2019

Diabetes type 2

ETIOLOGY



Adapted from: DeFronzo RA. Diabetes. 2009;58:773–795.

Adapted from: DeFronzo RA. Diabetes. 2009; 58:773–795.

Adapted from: Tahrani AA, et al. Lancet. 2011;378:182–197.

Clinical signs and symptoms of diabetes

SYMPTOMS OF TYPE 1 DIABETES



Abnormal thirst and dry mouth



Frequent urination



Lack of energy, fatigue



Blurred vision



Constant hunger



Sudden weight loss



Bed-wetting

SYMPTOMS OF TYPE 2 DIABETES



Excessive thirst and dry mouth



Frequent and abundant urination



Lack of energy, extreme tiredness



Blurred vision



Recurrent fungal infections of the skin



Slow healing wounds



Tingling or numbness in hands and feet

Diagnosis of diabetes

—Criteria for the diagnosis of diabetes

FPG ≥ 126 mg/dL (7.0 mmol/L). Fasting is defined as no caloric intake for at least 8 h.*

OR

2-h PG ≥ 200 mg/dL (11.1 mmol/L) during OGTT. The test should be performed as described by WHO, using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water.*

OR

A1C $\geq 6.5\%$ (48 mmol/mol). The test should be performed in a laboratory using a method that is NGSP certified and standardized to the DCCT assay.*

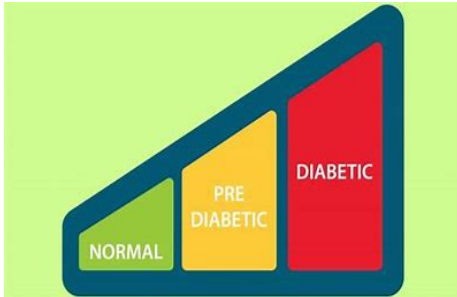
OR

In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose ≥ 200 mg/dL (11.1 mmol/L).



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Definition and diagnostic criteria of «prediabetes»



“Prediabetes”
is the term used for individuals
whose glucose levels do not meet the criteria for
diabetes but are too high to be considered normal.

Diabetes Care 2013;36:2995–3001

—Criteria defining prediabetes*

FPG 100 mg/dL (5.6 mmol/L) to 125 mg/dL (6.9 mmol/L) (IFG)

OR

2-h PG during 75-g OGTT 140 mg/dL (7.8 mmol/L) to 199 mg/dL (11.0 mmol/L) (IGT)

OR

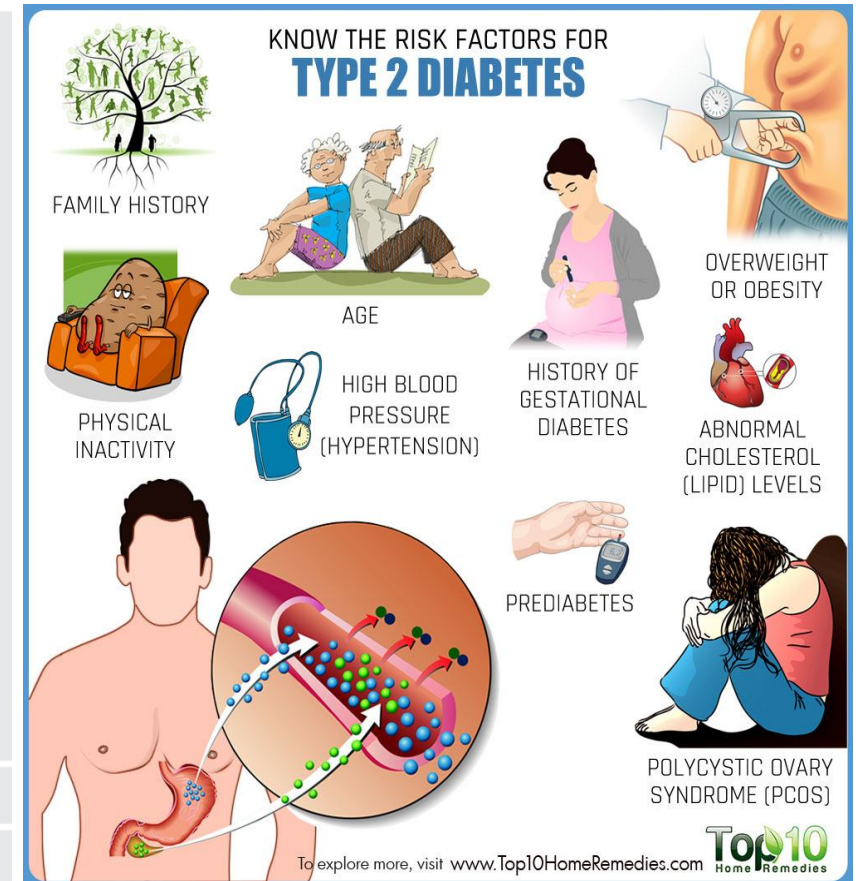
A1C 5.7–6.4% (39–47 mmol/mol)

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Risk factors for diabetes or prediabetes

—Criteria for testing for diabetes or prediabetes in asymptomatic adults

- Testing should be considered in adults with overweight or obesity ($\text{BMI} \geq 25 \text{ kg/m}^2$ or $\geq 23 \text{ kg/m}^2$ 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 ($\geq 140/90 \text{ mmHg}$ or on therapy for hypertension)
 - HDL cholesterol level $< 35 \text{ mg/dL}$ (0.90 mmol/L) and/or a triglyceride level $> 250 \text{ mg/dL}$ (2.82 mmol/L)
 - Women with polycystic ovary syndrome
 - Physical inactivity
 - Other clinical conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans)
- Patients with prediabetes ($\text{A1C} \geq 5.7\%$ [39 mmol/mol], IGT, or IFG) should be tested yearly.
- Women who were diagnosed with GDM should have lifelong testing at least every 3 years.



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Risk factors for diabetes or prediabetes in children and adolescent

—Risk-based screening for type 2 diabetes or prediabetes in asymptomatic children and adolescents in a clinical setting (202)

Testing should be considered in youth* who have overweight (≥ 85 th percentile) or obesity (≥ 95 th 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.



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Risk factors for diabetes type 2



Are you at risk for type 2 diabetes?

Diabetes Risk Test:

- How old are you?
Less than 40 years (0 points)
40–49 years (1 point)
50–59 years (2 points)
60 years or older (3 points)
- Are you a man or a woman?
Man (1 point) Woman (0 points)
- If you are a woman, have you ever been diagnosed with gestational diabetes?
Yes (1 point) No (0 points)
- Do you have a mother, father, sister or brother with diabetes?
Yes (1 point) No (0 points)
- Have you ever been diagnosed with high blood pressure?
Yes (1 point) No (0 points)
- Are you physically active?
Yes (0 points) No (1 point)
- What is your weight category?
See chart at right.

WRITE YOUR SCORE
IN THE BOX.

ADD UP
YOUR SCORE.

Height	Weight (lbs.)		
4' 10"	119–142	143–190	191+
4' 11"	124–147	148–197	198+
5' 0"	128–152	153–203	204+
5' 1"	132–157	158–210	211+
5' 2"	136–163	164–217	218+
5' 3"	141–168	169–224	225+
5' 4"	145–173	174–231	232+
5' 5"	150–179	180–239	240+
5' 6"	155–185	186–246	247+
5' 7"	159–190	191–254	255+
5' 8"	164–196	197–261	262+
5' 9"	169–202	203–269	270+
5' 10"	174–208	209–277	278+
5' 11"	179–214	215–285	286+
6' 0"	184–220	221–293	294+
6' 1"	189–226	227–301	302+
6' 2"	194–232	233–310	311+
6' 3"	200–239	240–318	319+
6' 4"	205–245	246–327	328+
1 point 2 points 3 points			
If you weigh less than the amount in the left column: 0 points			

Adapted from Bang et al., Ann Intern Med
151:775–783, 2009 • Original algorithm was validated
without gestational diabetes as part of the model.

If you scored 5 or higher:

You are at increased risk for having type 2 diabetes. However, only your doctor can tell for sure if you do have type 2 diabetes or prediabetes, a condition in which blood glucose levels are higher than normal but not yet high enough to be diagnosed as diabetes. Talk to your doctor to see if additional testing is needed.

Type 2 diabetes is more common in African Americans, Hispanics/Latinos, Native Americans, Asian Americans, and Native Hawaiians and Pacific Islanders.

Higher body weight increases diabetes risk for everyone. Asian Americans are at increased diabetes risk at lower body weight than the rest of the general public (about 15 pounds lower).

Lower Your Risk

The good news is you can manage your risk for type 2 diabetes. Small steps make a big difference in helping you live a longer, healthier life.

If you are at high risk, your first step is to visit your doctor to see if additional testing is needed.

Visit diabetes.org or call 1-800-DIABETES (800-342-2383) for information, tips on getting started, and ideas for simple, small steps you can take to help lower your risk.

Diabetes Risk Test | American Diabetes Association®

Learn more at diabetes.org/risktest | 1-800-DIABETES (800-342-2383)

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Complications of diabetes

Major Complications of Diabetes

Microvascular

Eye

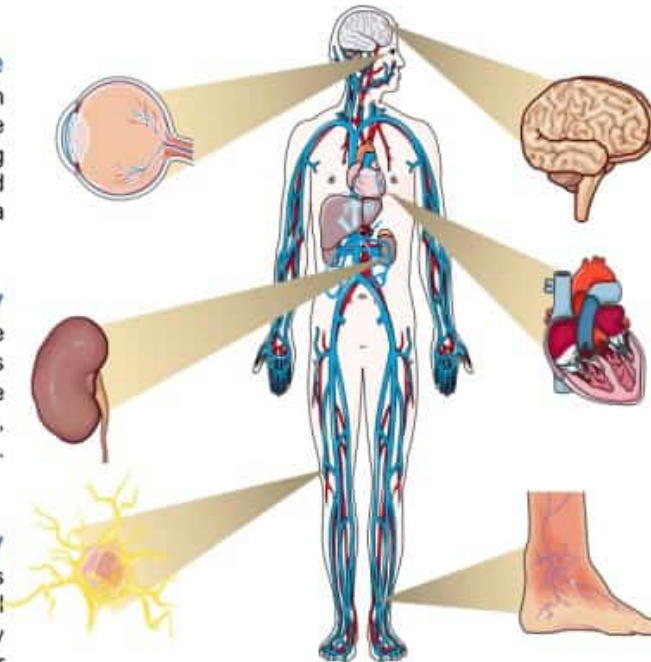
High blood glucose and high blood pressure can damage eye blood vessels, causing retinopathy, cataracts and glaucoma

Kidney

High blood pressure damages small blood vessels and excess blood glucose overworks the kidneys, resulting in nephropathy.

Neuropathy

Hyperglycemia damages nerves in the peripheral nervous system. This may result in pain and/or numbness. Feet wounds may go undetected, get infected and lead to gangrene.



Macrovascular

Brain

Increased risk of stroke and cerebrovascular disease, including transient ischemic attack, cognitive impairment, etc.

Heart

High blood pressure and insulin resistance increase risk of coronary heart disease

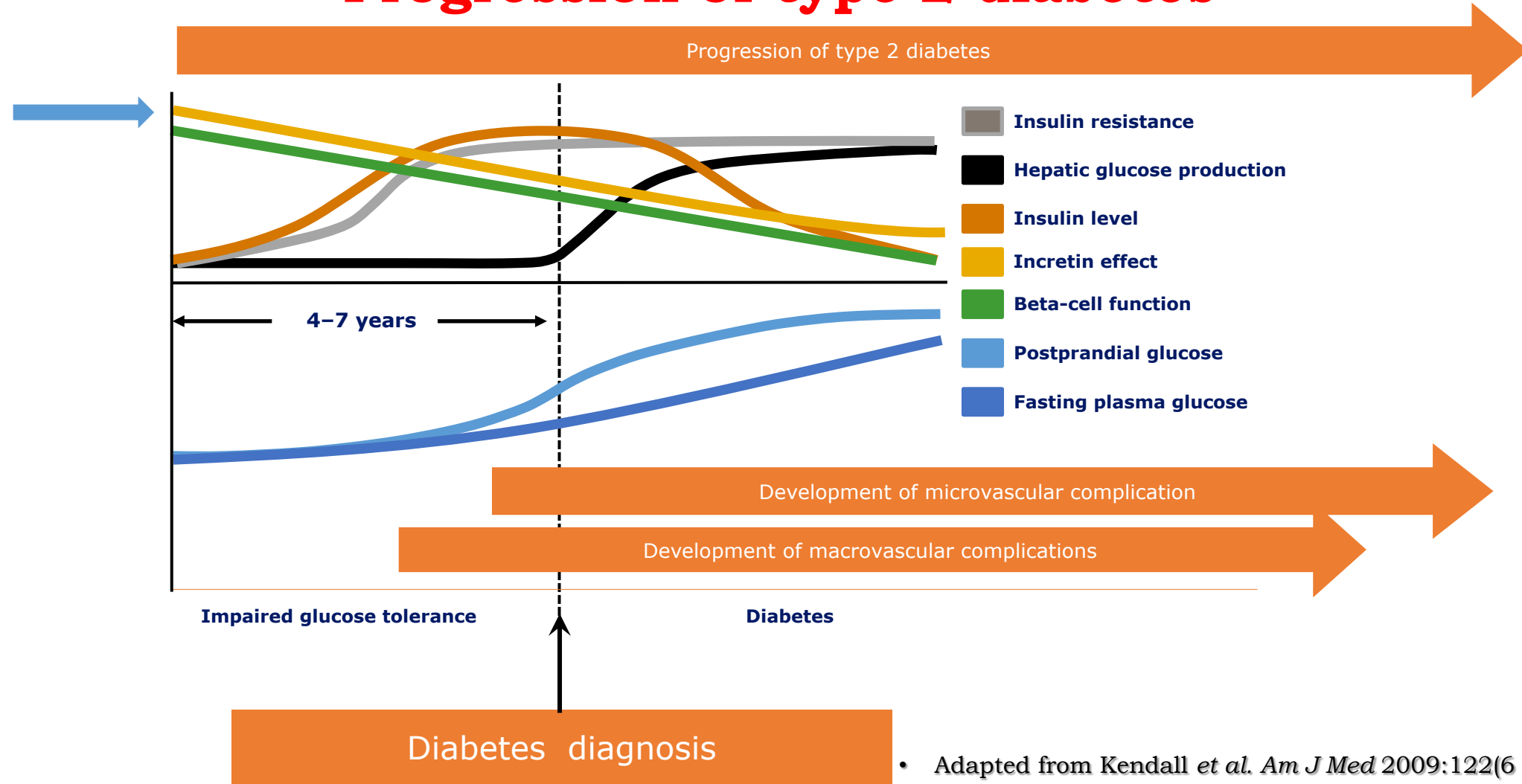
Extremities

Peripheral vascular disease results from narrowing of blood vessels increasing the risk for reduced or lack of blood flow in legs. Feet wounds are likely to heal slowly contributing to gangrene and other complications.

Clinical signs and symptoms of diabetes



Progression of type 2 diabetes



The first (human) patient treated with insulin

Leonard Thompson
(1908 – 1935)

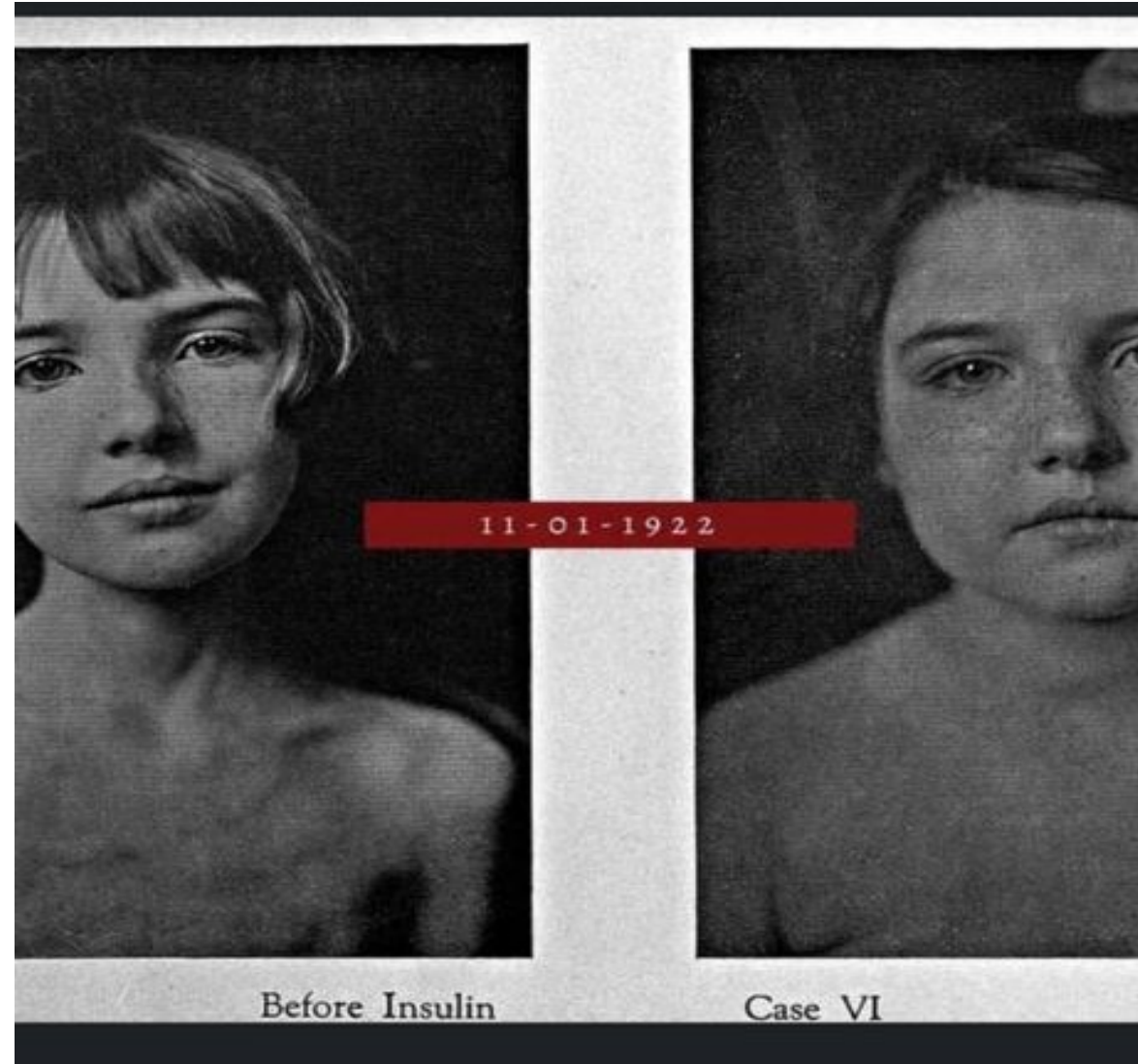
Dying from diabetes,
he was the first
human to get the
extract in
January 1922

Survived until
the age of 27.

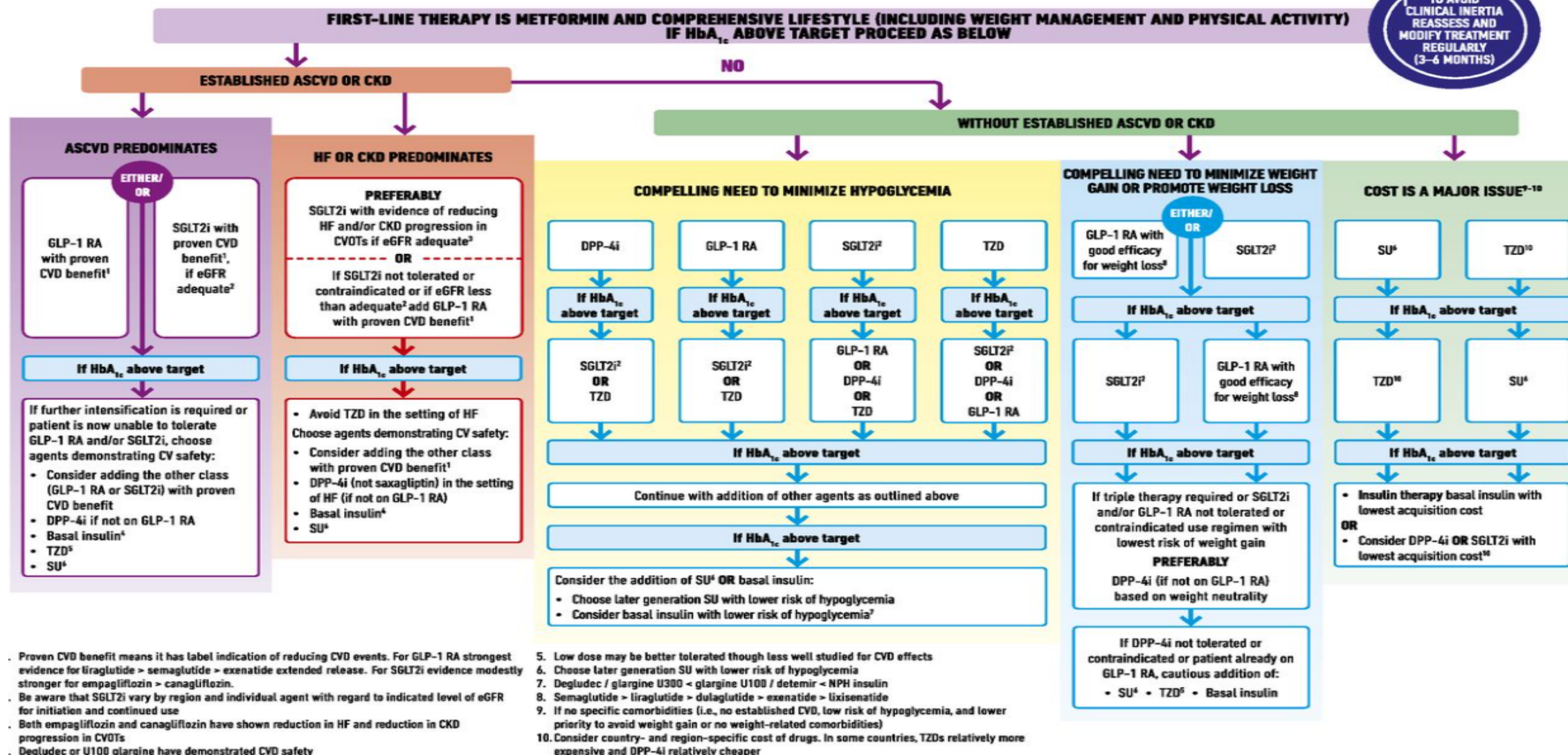


Banting FG, Best CH, Macleod JJR. *Am J Physiol.* 1922;59:479.





GLUCOSE-LOWERING MEDICATION IN TYPE 2 DIABETES: OVERALL APPROACH



Prevention of diabetes type 2

LIFESTYLE INTERVENTIONS

Recommendations

3.2 Refer patients with prediabetes to an intensive behavioral lifestyle intervention program modeled on the Diabetes Prevention Program (DPP) to achieve and maintain 7% loss of initial body weight and increase moderate-intensity physical activity (such as brisk walking) to at least 150 min/week. **A**

Diabetes Care 2020, Volume 43 Suppl. 1

Clinical Care/Education/Nutrition

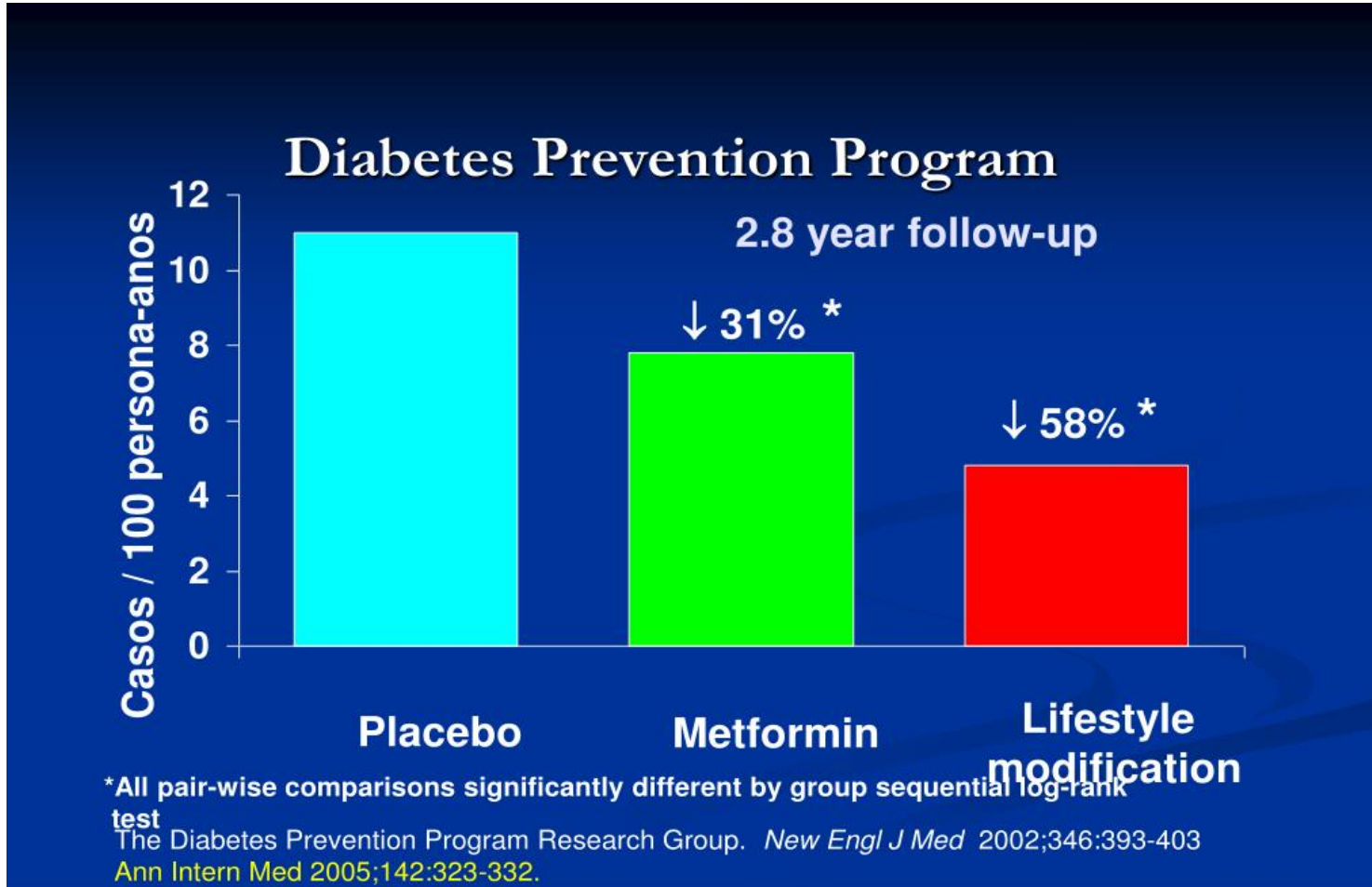
ORIGINAL ARTICLE

The Diabetes Prevention Program (DPP)

Description of lifestyle intervention

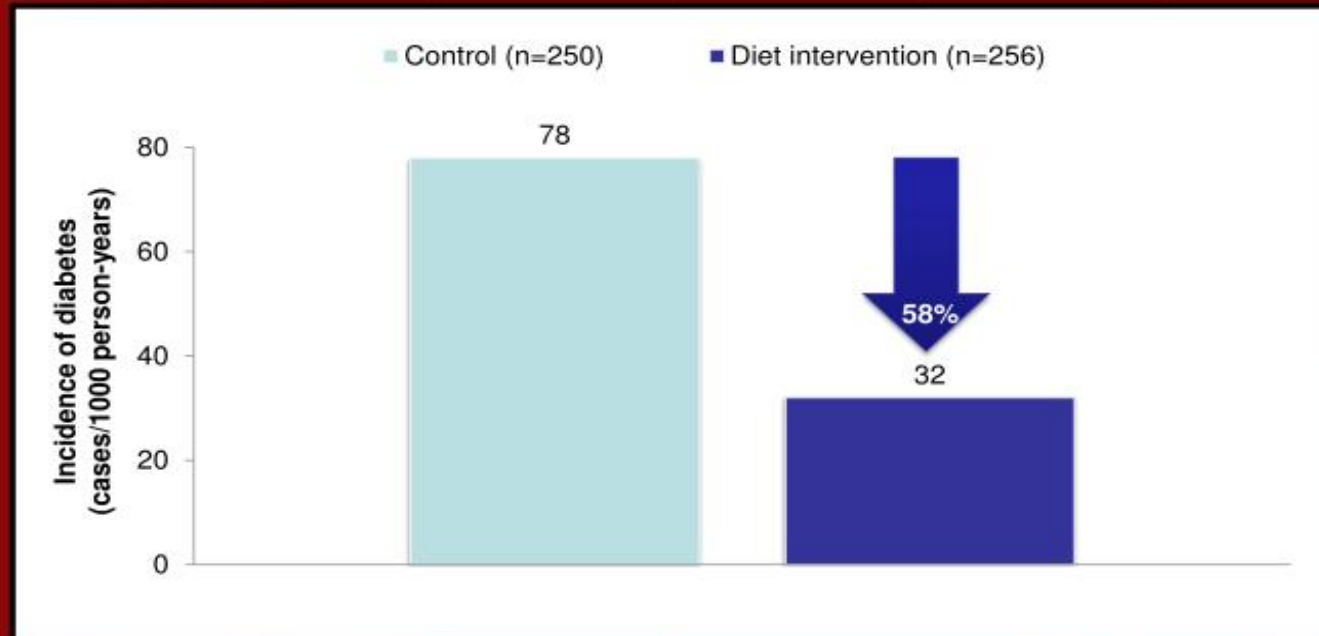
THE DIABETES PREVENTION PROGRAM
(DPP) RESEARCH GROUP

Diabetes Care 25:2165–2171, 2002

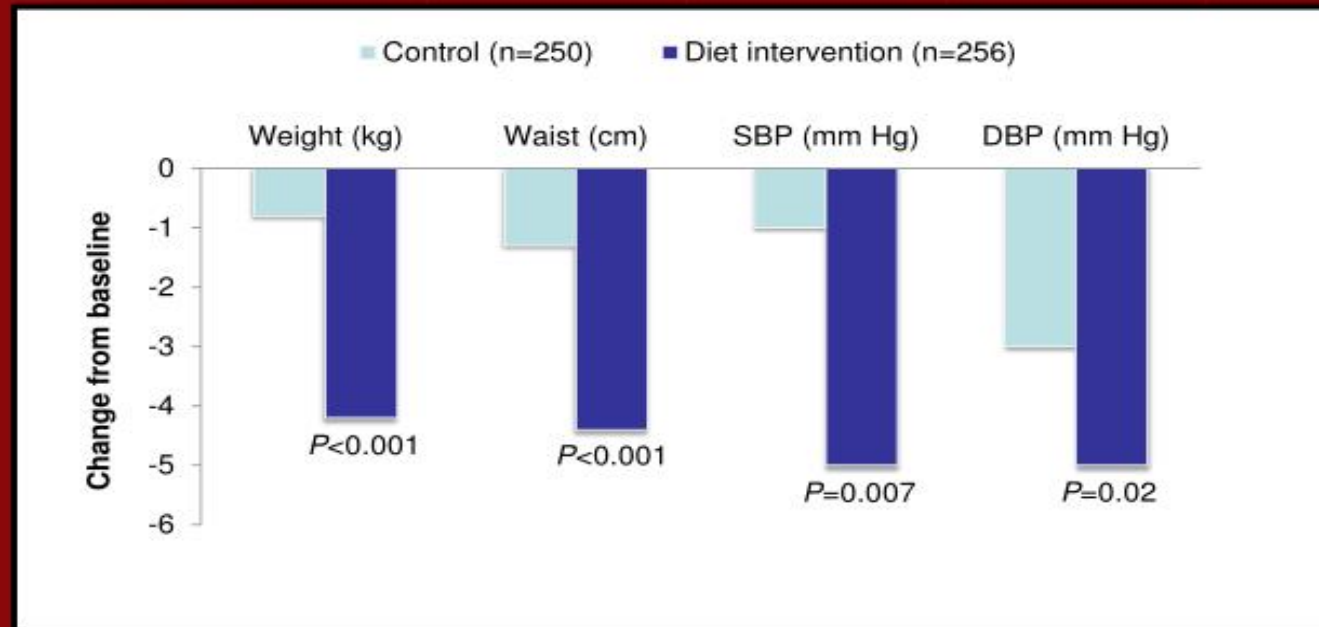


Diabetes Care 25:2165–2171, 2002

The Finnish Diabetes Prevention Study: Cumulative Incidence of Diabetes Over 4 Years



The Finnish Diabetes Prevention Study: Lifestyle Modifications





Nutrition Therapy for Adults With Diabetes or Prediabetes: A Consensus Report

<https://doi.org/10.2337/dci19-0014>

*Alison B. Evert,¹ Michelle Dennison,²
Christopher D. Gardner,³
W. Timothy Garvey,^{4,5} Ka Hei Karen Lau,⁶
Janice MacLeod,⁷ Joanna Mitri,⁸
Raquel F. Pereira,⁹ Kelly Rawlings,¹⁰
Shamera Robinson,¹¹ Laura Saslow,¹²
Sacha Uelmen,¹¹ Patricia B. Urbanski,¹³ and
William S. Yancy Jr.^{14,15}*

Medical nutrition recommendations

—Medical nutrition therapy recommendations

Topic	Recommendation	Evidence rating
Effectiveness of nutrition therapy	5.6 An individualized medical nutrition therapy program as needed to achieve treatment goals, provided by a registered dietitian nutritionist (RD/RDN), preferably one who has comprehensive knowledge and experience in diabetes care, is recommended for all people with type 1 or type 2 diabetes, prediabetes, and gestational diabetes mellitus.	A
	5.7 Because diabetes medical nutrition therapy can result in cost savings B and improved outcomes (e.g., A1C reduction, reduced weight, decrease in cholesterol) A , medical nutrition therapy should be adequately reimbursed by insurance and other payers. E	B, A, E
Energy balance	5.8 For all patients with overweight or obesity, lifestyle modification to achieve and maintain a minimum weight loss of 5% is recommended for all patients with diabetes and prediabetes.	A
Carbohydrates	5.11 Carbohydrate intake should emphasize nutrient-dense carbohydrate sources that are high in fiber and minimally processed. Eating plans should emphasize nonstarchy vegetables, minimal added sugars, fruits, whole grains, as well as dairy products.	B
	5.12 Reducing overall carbohydrate intake for individuals with diabetes has demonstrated the most evidence for improving glycemia and may be applied in a variety of eating patterns that meet individual needs and preferences.	B
	5.13 For people with diabetes who are prescribed a flexible insulin therapy program, education on how to use carbohydrate counting A and on dosing for fat and protein content B should be used to determine mealtime insulin dosing.	A, B
	5.14 For adults using fixed insulin doses, consistent pattern of carbohydrate intake with respect to time and amount, while considering the insulin action time, can result in improved glycemia and reduce the risk for hypoglycemia.	B

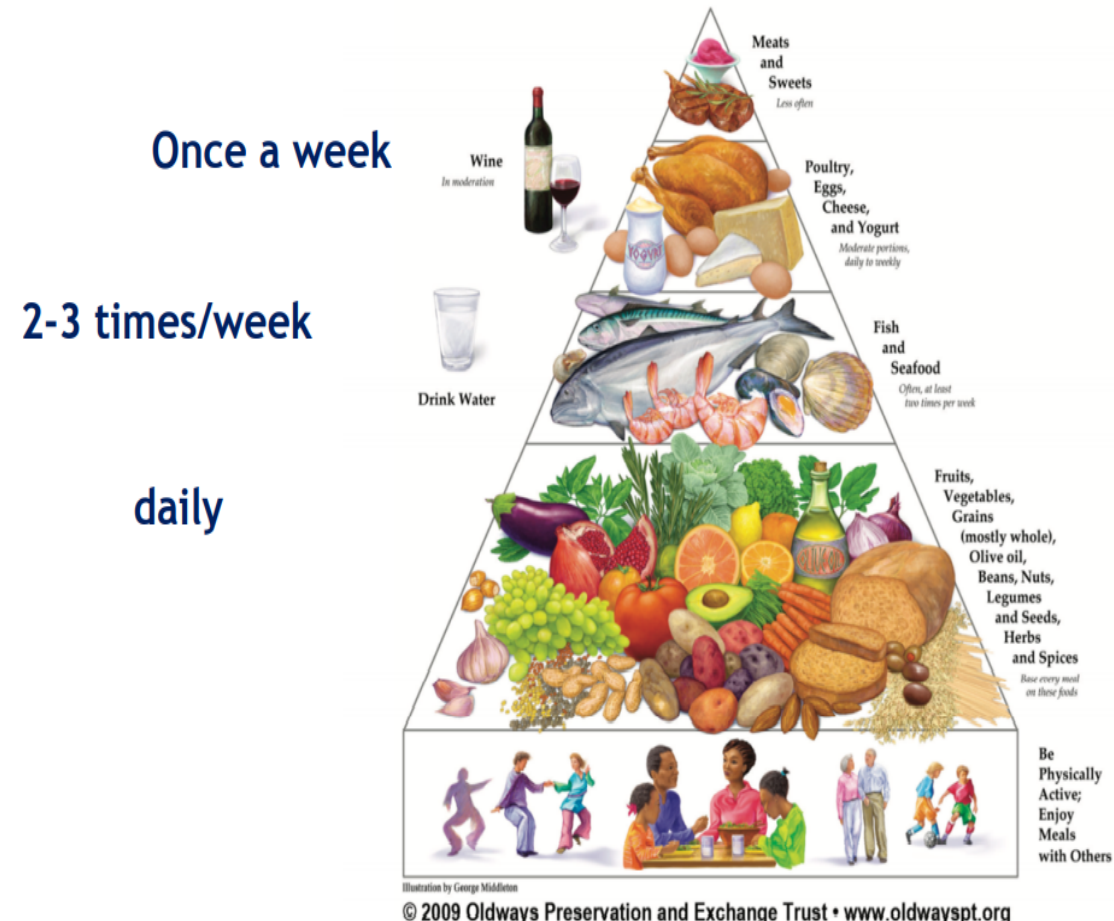
Medical nutrition recommendations

Protein	5.16 In individuals with type 2 diabetes, ingested protein appears to increase insulin response without increasing plasma glucose concentrations. Therefore, carbohydrate sources high in protein should be avoided when trying to treat or prevent hypoglycemia.	B
Dietary fat	5.17 An eating plan emphasizing elements of a <u>Mediterranean-style eating</u> pattern rich in monounsaturated and polyunsaturated fats may be considered to improve glucose metabolism and lower cardiovascular disease risk.	B
	5.18 Eating foods rich in long-chain n-3 fatty acids, such as fatty fish (EPA and DHA) and nuts and seeds (ALA), is recommended to prevent or treat cardiovascular disease B ; however, evidence does not support a beneficial role for the routine use of n-3 dietary supplements. A	B, A
Micronutrients and herbal supplements	5.19 There is no clear evidence that dietary supplementation with vitamins, minerals (such as chromium and vitamin D), herbs, or spices (such as cinnamon or aloe vera) can improve outcomes in people with diabetes who do not have underlying deficiencies, and they are not generally recommended for glycemic control.	C

Diabetes Care 2020

Food pyramid of «mediterranean diet»

The **Mediterranean diet** is known to be the healthiest food pattern. It is mainly based on foods of vegetable origin: whole grains, fruits, vegetables, olive oil and legumes consumed frequently and in high quantities. Moderate consumption of fish, white meat, eggs and dairy products. Red meat, foods rich in sugars and sporadically saturated fatty acids.



The western diet vs mediterranean diet

The **Western Diet**, typical of western countries, is a diet characterized by high consumption of refined cereals, red meat, products rich in saturated fats and sugars.



The **Mediterranean Diet**, on the other hand, is characterized by high intake of vegetables, fruits, legumes, nuts and whole grains, consumption of medium-high fish, high intake of unsaturated fatty acids (olive oil), low intake of saturated fatty acids and dairy products, reduced meat intake, especially red, moderate salt intake.



Mediterranean diet

The **Mediterranean diet** has a high nutritional pattern, able to provide an adequate supply of micro and macronutrients.

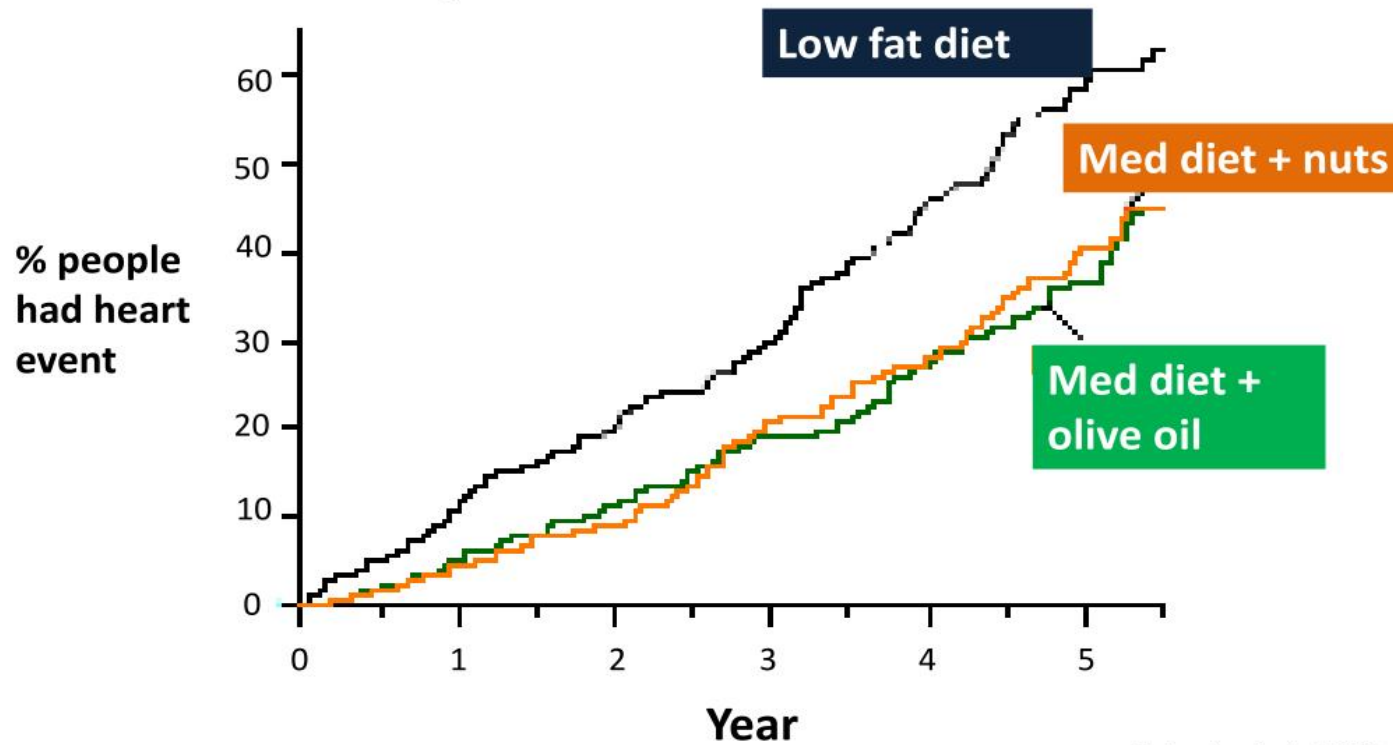
High adherence to the Mediterranean diet has been shown to be associated with a reduced risk of nutritional deficiencies, mortality from cardiovascular diseases, cancers and the incidence of chronic degenerative diseases such as Parkinson's and Alzheimer's.



Mediterranean diet

PREDIMED Study

Heart events over 5 years



Estruch et al., 2013

Mediterranean diet



Critical Reviews in Food Science and Nutrition 2019



ISSN: 1040-8398 (Print) 1549-7852 (Online) Journal homepage: <https://www.tandfonline.com/loi/bfsn20>

Mediterranean diet, cardiovascular disease and mortality in diabetes: A systematic review and meta-analysis of prospective cohort studies and randomized clinical trials

Nerea Becerra-Tomás, Sonia Blanco Mejía, Effie Viguiliouk, Tauseef Khan, Cyril W.C. Kendall, Hana Kahleova, Dario Rahelić, John L. Sievenpiper & Jordi Salas-Salvadó

DIABETES/METABOLISM RESEARCH AND REVIEWS

Diabetes Metab Res Rev 2016; **32**: 73–81.

Published online 27 July 2015 in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/dmrr.2672

RESEARCH ARTICLE

Adherence to Mediterranean diet and 10-year incidence (2002–2012) of diabetes: correlations with inflammatory and oxidative stress biomarkers in the ATTICA cohort study

Mediterranean diet: dietary advice

- Partially skimmed milk
- Yogurt white
- Pasta/farro/barley/ rice: prefer parboiled rice maximum twice a day and whole grain
- Bread : prefer whole grain
- Meat: rabbit, turkey, turkey beef, lean pork lean
- Fish: fresh or frozen fish, prefer blue fish (sardinian, anchovies), squid, octopus. Cod, hake, mackerel or sea bass better no more than 1 time a week. Crustaceans and molluscs bivalve occasionally. To avoid large fish (swordfish and tuna).
- Fruits 2-3 times a day. To be taken no more than 2-3 times a week: kiwi or grapes or banana or pineapple.
- Vegetables: fresh or frozen vegetables, not smoothie or past, 2 times a day

Dietary composition in diabetes

In the daily diet, the intake of simple fast-absorbing sugars (glucose and sucrose) should be carefully evaluated, giving preference to complex slow-absorbing sugars (starch).

The total daily share of **carbohydrates** must not exceed **50-55%** of the total calories, provided that at least 80% of it is made of starch and the remaining 20% of non-insulin-dependent sugars and fiber.

Fiber should be taken in high quantities, especially water-soluble ones, capable of slowing down the intestinal absorption of carbohydrates and cholesterol.



Dietary composition in diabetes

Proteins must represent about **15-20%** of the total calories, and at least a third must consist of proteins of animal origin, as they contain the indispensable essential amino acids (present, for example, in eggs, meat, milk). We should give priority to proteins from fish, lean meats, eggs and fresh dairy products such as milk and yoghurt and limit 'red' meats and cold cuts/cheeses to a minimum.



Dietary composition in diabetes

Fats must provide the remaining **25-30%** of the total calories and those of vegetable origin with a high content of mono- and polyunsaturated fatty acids (which we find, for example, in fish, olive oil, nuts) should be preferred for their role in the prevention of cardiovascular diseases.

Both saturated fatty acids and cholesterol-rich foods (e.g. chicken, pork or calf liver) should be limited, which could promote dangerous hyperlipidemia. Most fats should be of the "insaturated" type and especially of the monounsaturated subtype, that is, the one that is contained in excellent quantities in extra virgin olive oil, but also in some seed oils (such as peanut oil). In addition, polyunsaturated fats such as those found in fish and fishery products and dried fruit must also be present.



General information of dietary composition in diabetes

Components of diet	Recommended overall quantity	Recommended amount of individual nutrients	Practical advice
<u>Carbohydrates</u>	45-60% Kcal tot.	sucrose and other added sugars less than 10%	vegetables, legumes, fruits, cereals preferably whole grains, foods of the Mediterranean diet
<u>Fibers</u>	>40 g/die, especially soluble		5 servings a week of vegetables or fruit and 4 servings a week of legumes
<u>Proteins</u>	10-20% Kcal tot.		
<u>Fats</u>	35% Kcal tot.	saturated <8-10%	among the seasoning fats prefer vegetables ones except palm oil and coconut

Dietary advice

- ✓ Acaloric sweeteners are safe if consumed in moderation.



- ✓ Habitual consumption of foods rich in antioxidants, microelements and other vitamins should be encouraged.



- ✓ There is no evidence to recommend the use of “dietary foods” for diabetics



Dietary advice



Recommended cooking methods: grilled, grilled, in the oven, steamed, in a bain-marie and in foil. For fried foods, use olive or seed oil, but do not exceed 180 ° in temperature during cooking (no smoke and the oil must not become dark). Legumes and vegetables must be cooked in very little water and in a closed container so as not to lose their vitamin and mineral wealth.

Condiments

For the condiments, vegetable fats (olive or seed oil) are preferred. A particular limitation of salt is not necessary, except in the presence of hypertension, chronic kidney disease or other contraindications.

To flavor foods you can use particular types of sodium-free salt that can be purchased at the pharmacy.

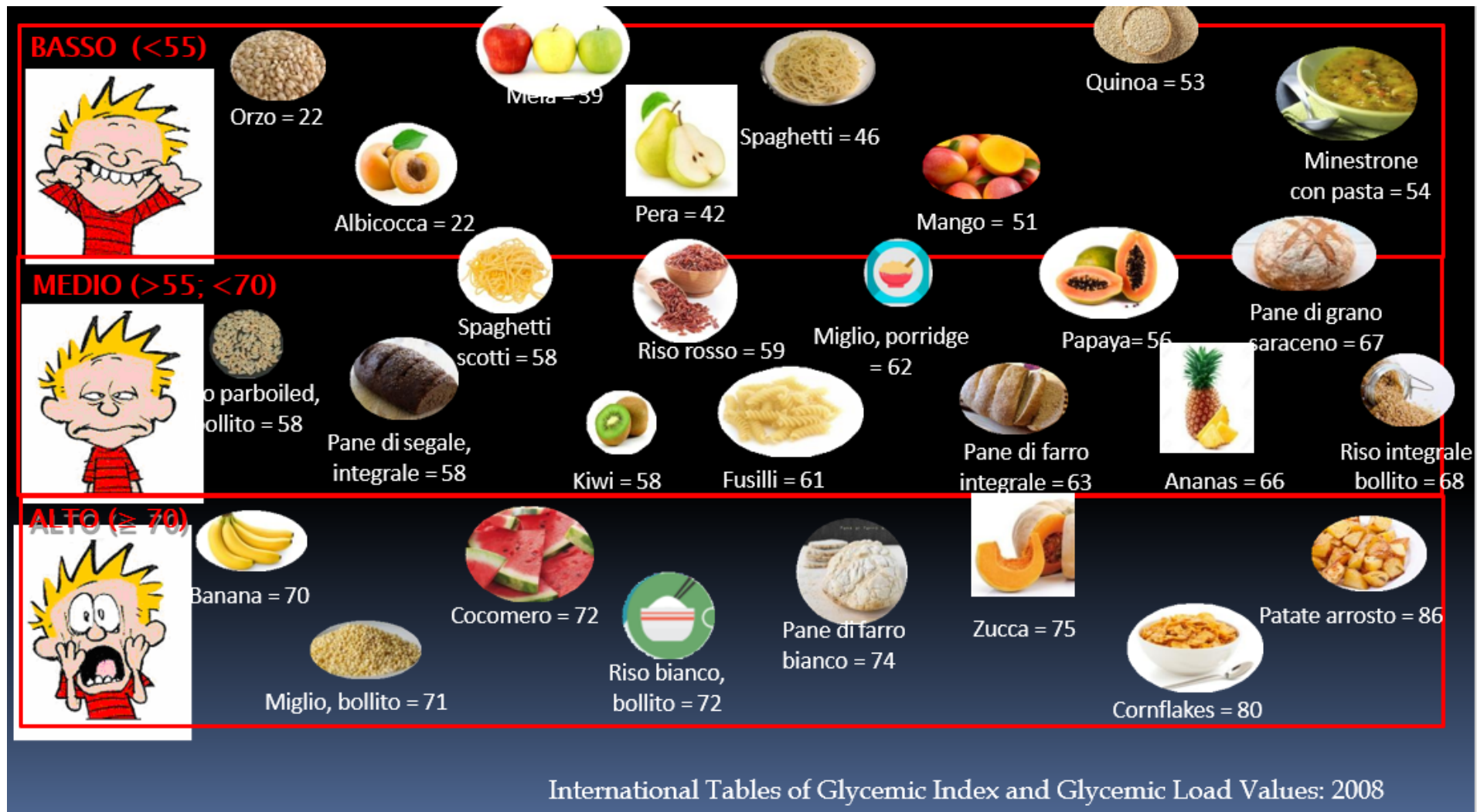
All spices such as pepper, paprika, chilli, mustard, nutmeg, cinnamon, saffron, ginger, fennel seeds, thyme, marjoram, sage, rosemary, basil, bay leaf, mint, can be used as well as lemon juice, vinegar, meat extracts, stock extracts and stock cubes.

Glycemic Index

- Glycemic index is the rate at which a sugar is converted into glucose once ingested.
- It is the rate at which the concentration of glucose in the blood (blood glucose) increases after ingestion of a defined amount (50 gr) of a given glucid.
- The glycemic index is expressed in percentage terms, in relation to that of the same amount of glucose.
- Glucose is the reference carbohydrate and has an index of 100. E.g. if a food has a glycemic index of 60, it means that by ingesting 50 grams of that food, blood glucose rises by 60%, compared to what happens with 50 grams of glucose.



Glycemic Index



Counts carbohydrates

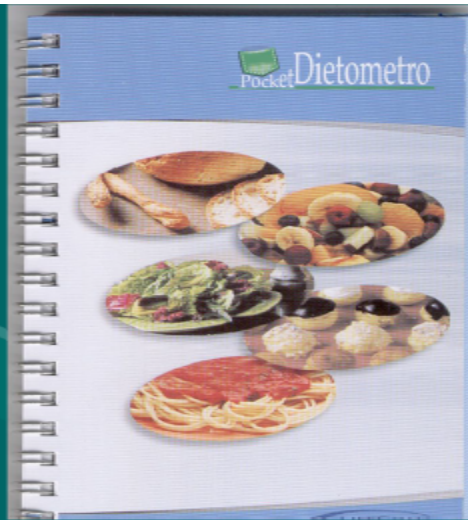
- ❖ An effective strategy for blood control in diabetic patients in intensive insulin treatment.
- ❖ It is a method that allows you to adjust the dose of insulin ready to be administered at a meal to the carbohydrate content of that particular meal.
- ❖ It represents a planning system that requires commitment but allows flexibility and freedom of choice in nutrition
- ❖ To learn the carbohydrate count it is necessary to learn to recognize which foods contain them and above all to be able to count the content in grams.
- ❖ To exactly calculate the carbohydrate content in foods, the appropriate table must be available which provides the CHO content per 100 g of food.



Counts carbohydrates

- Divide the CHO content by 100 g of a food by 10 you will thus have the content of 10 gr.
- Multiply the CHO content by 10 gr for the grams of food present in the portion (estimated or weighed) .
- For example, in 80 grams of bread there will be:
 $100 \text{ g bread} = 60 \text{ gr CHO} / 10 \text{ g bread} = 6 \text{ gr CHO}$
 $80 \text{ g bread} (6 \times 8) = 48 \text{ gr CHO}$



A close-up photograph showing a person's hand holding a small, white, cylindrical container, likely a portion of a meal. The person's index finger is pointing to the 'Nutrition Facts' label on the side of the container. The label is partially legible, showing columns for 'Amount Per Serving' and 'Percent Daily Value'. The background is blurred, showing shelves with various jars and containers in a kitchen or pantry setting.

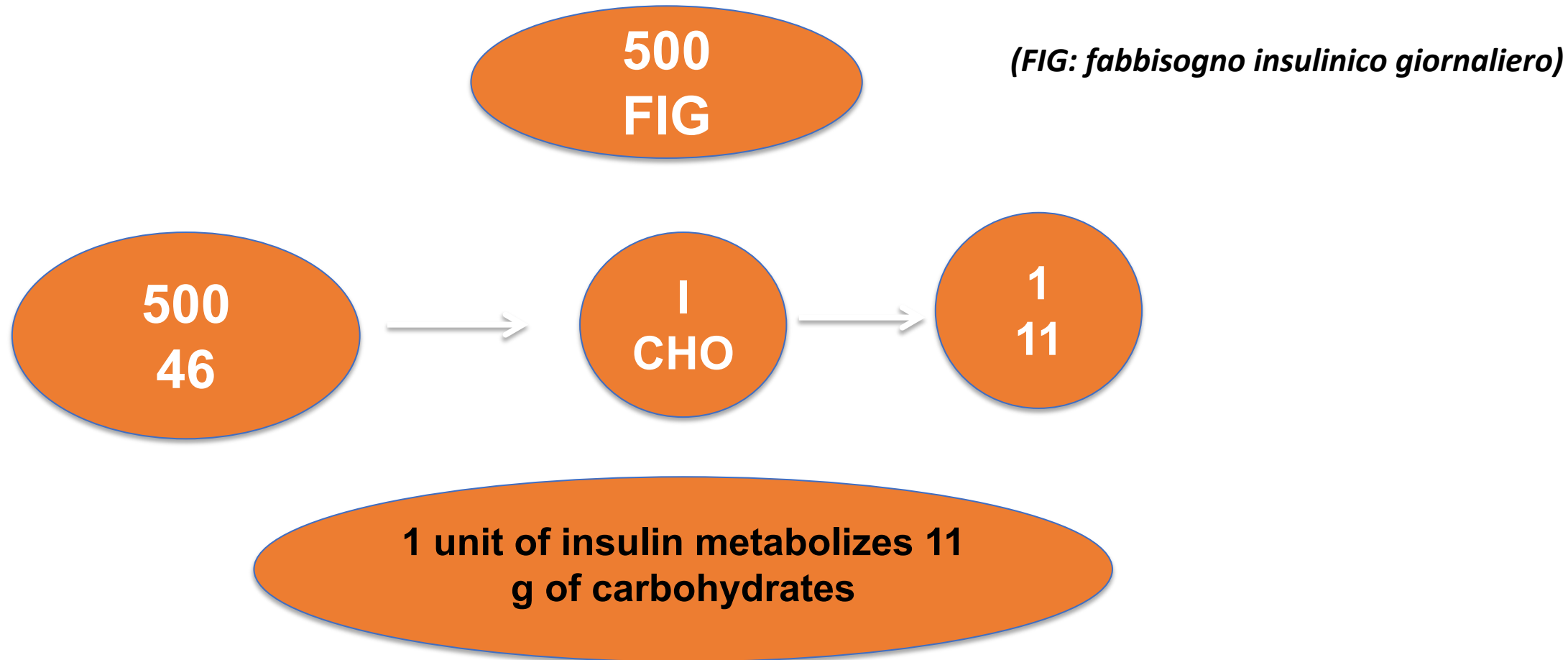
The carbohydrate insulin ratio

- The insulin/ carbohydrate ratio (I / CHO or I / C ratio) indicates the grams of carbohydrates metabolized by 1 U of insulin, for a given subject.
- This allows you to adjust the insulin dose to the carbohydrate intake of each individual meal.
- Generally 1 unit of preprandial insulin metabolizes 10 to 15 g of CHO



The carbohydrate insulin ratio

- It is calculated using the mathematical rule called the 500 rule:



The carbohydrate insulin ratio

- Once you know the carbohydrate insulin ratio for a meal you have to divide the grams of total carbohydrates of that meal by the ratio of insulin carbohydrates.
- For example: if a meal contains 60 grams of CHO and the I/CHO ratio is 1/15, it divides $60/15 = 4$, i.e. 4 U of insulin is needed for the meal under consideration.



MirNAs as biomarkers of nutritional therapy

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Original article

MiRNAs profile as biomarkers of nutritional therapy for the prevention of type 2 diabetes mellitus: From the CORDIOPREV study

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Thanky you attention

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