

Diets For Diabetes

Dana Issa Marbu'

Diabetes Mellitus (DM)

- There are more than 23 million Americans with diabetes mellitus. (5) Of this population, 90 to 95% has type 2 diabetes and the remaining 5 to 10% has type 1 diabetes.
- The World Health Organization (WHO) expert committee on Diabetes Mellitus defines the disease as “ a state of chronic hyperglycemia, which may be due to lack of insulin or to an excess of factors that oppose its action. This imbalance leads to abnormalities of CHO, protein and fat metabolism.”
- **Diabetes** stands for “Siphon” passed water like a siphon.
- **Mellitus** stands for “honey”.

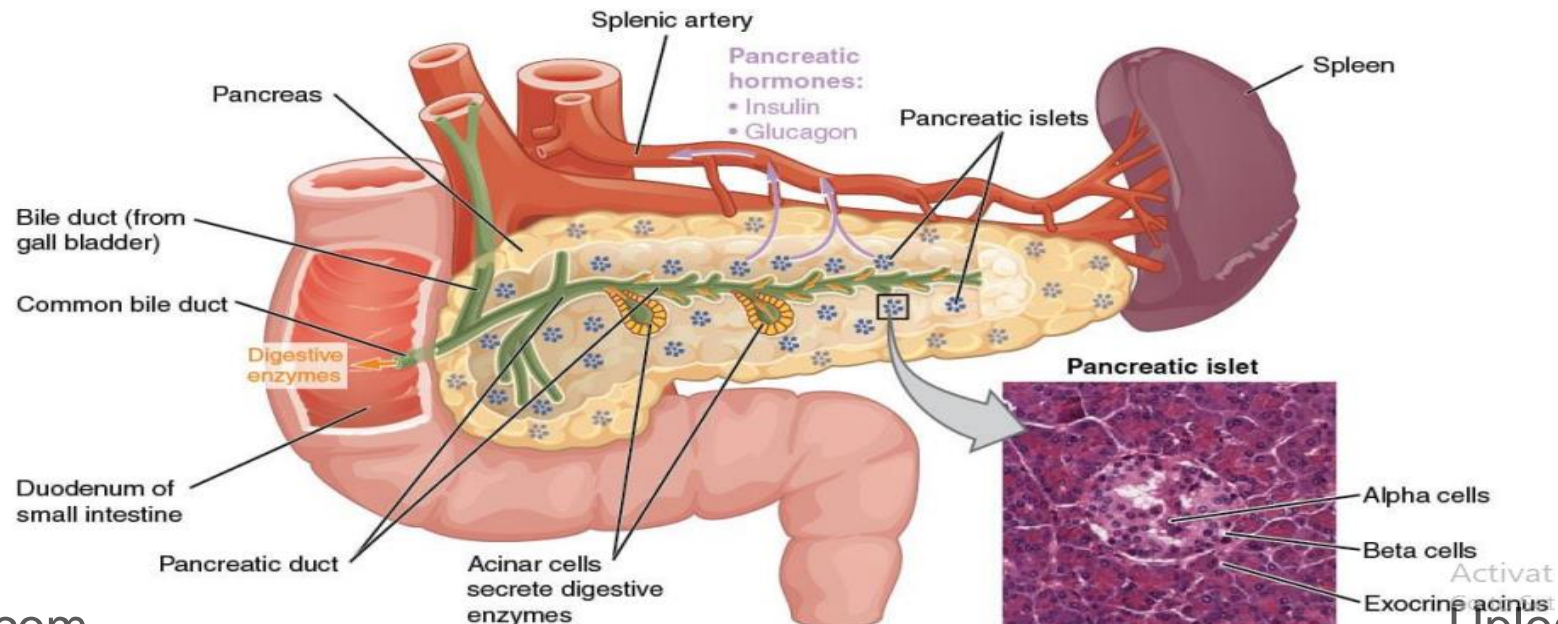
Types of Diabetes Mellitus

- Prediabetes (blood sugar levels are higher than normal, but not high enough yet to be diagnosed as type 2 diabetes).
- Type 1 Diabetes
- Type 2 Diabetes
- Gestational diabetes (during pregnancy).
- Diabetes insipidus ? **An uncommon disorder that causes an imbalance of fluids in the body, leads you to produce large amounts of urine and extreme thirst.**

Diabetes Mellitus (DM)

- DM is caused by absolute or relative lack of insulin;
 - Not being produced by the pancreas.
 - Produced in small quantities; thus insufficient for body needs.

The pancreas



Diabetes Mellitus (DM)

- There are two main types of diabetes are, **Type 1 (insulin-dependent)**:
 - 1- Childhood and early adult life.
 - 2- 15% of cases of diabetes in EU and USA.
 - 3- Caused by autoimmune destruction of insulin-producing cells of islets of Langerhans in the Pancreas.
 - 4- Absolute insulin deficiency.

Diabetes Mellitus (DM)

- **Type 2 Diabetes or noninsulin-dependent:**

1- Middle-aged or elderly.

2- Most common type; over 85% cases in most populations.

3- It caused by impaired insulin secretion and resistance.

4- ~ 80% of type 2 diabetic patients are **obese**.

5- However, type 2 diabetes is increasing significantly among children due to increase in childhood obesity.

Diabetes Mellitus (DM)

- **Gestational Diabetes:**

1- Gestational diabetes occurs when your body can't make enough insulin during your pregnancy.

2- Researchers don't yet know why some women get gestational diabetes.

3- Excess weight before pregnancy often plays a role.

4- During pregnancy, hormone levels change, making it harder for the body to process blood sugar efficiently.

Diabetes Mellitus (DM)

- **Gestational Diabetes Risk factors:**
 - Being overweight or obese
 - Not being physically active
 - Having prediabetes
 - Having had gestational diabetes during a previous pregnancy

Diabetes Mellitus (DM)

- Complications generally start to show after several years:

Small blood vessels (Microangiopathy), in the eye, Kidney and nerves.

- 1- Retinopathy is the most common cause of blindness.
- 2- Nephropathy is the major cause of Kidney failure.
- 3- Neuropathy can contribute to foot ulcers and other disorders.

Arterial disease or Macroangiopathy

- 1- CHD and strokes.

Diabetes Mellitus

- Insulin is required for a person with **type 1 diabetes** to survive.
- Insulin may be given by injections or by an insulin pump.
- Currently there is no known cure for type 1 diabetes, although research is consistently underway.
- **Type 2 diabetes** may require medication to control blood glucose.
- This could include oral medications, incretin injections or insulin.

↳ glucagon
like peptide
receptor

CONSISTENT CARBOHYDRATE DIET

Consistence Carbohydrate Diet

- **The goals of nutrition therapy in treating diabetes are:**
 - 1- Maintain as near normal blood glucose levels as is safely possible.
 - 2- Achieve optimal serum lipid levels (cholesterol, HDL and LDL cholesterol, and triglycerides) and blood pressure levels to prevent and treat cardiovascular disease.
 - 3- Prevent and treat short-term complications such as hyperglycemia or hypoglycemia and long-term complications.
 - 4- Improve overall health, without restrictions.

Consistence Carbohydrate Diet

- **Adequacy**

- 1- Dietary Reference Intakes (DRIs).
- 2- Meal plans with less than 1,200 calories may be low in vitamins and minerals and are generally not recommended.

- **Diet Principles**

- 1- Individualization.
- 2- Energy; Weight reduction of 5 to 10% of initial body weight.
- 3- Exercise; improves the body's response to insulin and lower blood glucose levels.
 - Exercise Vs. physical activity

Consistence Carbohydrate Diet

- **Physical Activity Level (PAL).**
 - Any movement of the body produced by skeletal muscles and resulting in energy expenditure.
- **Exercise.**
 - A physical activity that is structured, planned and is done at a certain intensity level, frequency, and duration
 - The goal of exercise is to increase physical fitness.
- Exercise is part of physical activity, but not the opposite.

Consistence Carbohydrate Diet

- **Evidence**

1- longitudinal study found that regular exercise (**30 minutes /4 times a week**) reduced LDL B by 20% among 17 overweight males aged 40- 50 years after one-year exercise training, HDL increased 9%.

2- Similar results were revealed in a meta-analysis that included 17 articles; **moderate to intense** exercise with **30-60 minutes / 4 times a week** had increased HDL by 0.05 mmol/L and decreased triglyceride levels 0.021 mmol/L

Consistence Carbohydrate Diet

3- a 20-weeks intensive aerobic training (60 minutes/ 5 times a week) intervention conducted aimed to measure changes in BP and glucose/insulin response to oral glucose tolerance test among sedentary male participants.

- Results showed no significant changes in BP, while improvements were observed in glucose intolerance.
- Differences in results could be due to interventions duration, follow ups and participants' risk factors.

Consistence Carbohydrate Diet

4- Carbohydrate, 45 to 65% of total calories.

- Carbohydrates are found in four main groups of food: (a) starches, (b) fruit and fruit juices, (c) milk and milk products, and (d) sweets, desserts, and other carbohydrates.
- Simple CHO
- Complex CHO
- Dietary Fiber: all plant polysaccharides that are resistant to hydrolysis by the digestive enzymes of man.

Consistence Carbohydrate Diet

5- Protein and Fat.

- Do not affect the blood glucose directly like carbohydrates do.
- Not need to be consistent; they have little effect on blood glucose levels.
- 20-35% fat, 15-30% protein.

6- Reducing cardiovascular risk.

- Saturated fat should be limited to less than 7% of total calories and trans fat should be minimized.
- Diabetes is a single risk factor for cardiovascular disease.

Consistence Carbohydrate Diet

7- Meal Patterns.

- Food, exercise, and insulin or oral hypoglycemic agents influence blood glucose concentration.
- Regular pattern for taking insulin injections, meals and snacks, and exercise can be worked out so that both hyperglycemia and hypoglycemia can be minimized.

8- Special food

- Are not necessary and may be expensive.
- Foods labeled “sugar-free,” “no sugar,” “reduced sugar,” or “lower sugar” may be high in fat, calories.

Consistence Carbohydrate Diet

- **Menu Planning**
- Consistent Carbohydrate Diet.
- This pattern will help promote optimal blood glucose control.
- Carbohydrate counting is based on choices or grams per meal and snack.
- One carbohydrate choice equals 15 grams of carbohydrate.
- Meal plans may vary from three to five choices (45–75 grams) of carbohydrates per meal
- One to two choices (15–30 grams) of carbohydrates per snack.
- Not all choices have the same nutritional value and may alter overall nutrition status of the individual.

Consistence Carbohydrate Diet

- **Example**
- 285 g of CHO
- Three meals, two snacks.
- Each meal contains 5 choices (12-15 g of CHO).
- Each snack contains 2 choices.

Consistence Carbohydrate Diet

Table 6.2 Suggested Menu Plan for Consistent Carbohydrate Diet

(Select from foods described)

MEAL PATTERN	CONSISTENT CARBOHYDRATE DIET	GENERAL DIET
Breakfast		
5 carbohydrate choices equal to ~75 grams carbohydrate	½ c. orange juice (1 choice) ½ c. oatmeal (1 choice) 1 slice toast (1 choice) 1 egg 1 c. fat-free milk (1 choice) 1 Tbsp. regular jelly (1 choice) 1 tsp. soft margarine coffee	½ c. orange juice ½ c. oatmeal 1 slice toast 1 egg 1 c. fat-free milk 1 Tbsp. jelly 1 tsp. soft margarine coffee
Lunch or Supper		
5 carbohydrate choices equal to ~75 grams carbohydrate	2 oz. roasted chicken breast ½ c. mashed potatoes/gravy (1 choice) ½ c. mixed vegetables (without corn or peas) 1 dinner roll (1 choice) 2 tsp. soft margarine 2 x 2 brownie/frosting (2 choices) 1 c. fat-free milk (1 choice) coffee	2 oz. roasted chicken breast ½ c. mashed potatoes/gravy ½ c. mixed vegetables 1 dinner roll 2 tsp. soft margarine 2 x 2 brownie/frosting 1 c. fat-free milk coffee
Dinner		
5 carbohydrate choices equal to ~75 grams carbohydrate	Tuna salad sandwich with 2 slices bread (2 choices) 1 cup tomato soup with 2 crackers (1 choice) ½ c. fruit cocktail (1 choice)	Tuna salad sandwich with 2 slices bread 1 cup tomato soup 2 crackers ½ c. fruit cocktail

Consistence Carbohydrate Diet

Snack

	½ c. carrots	½ c. carrots
1-2 carbohydrate	½ c. cubed cantaloupe (½	½ c. cubed cantaloupe
choices equal to	choice)	3 cups popcorn (1 choice)
15-30 grams	3 cups popcorn (1 choice)	
carbohydrate		

Consistence Carbohydrate Diet

- Gestational diabetes follows the same principles as the Consistent Carbohydrate Diet.
- An evening snack is necessary to prevent ketosis and hypoglycemia.
- Women are advised to check ketones before breakfast/ fasting. why?.
- The meal pattern for breakfast is reduced in carbohydrates.
- Hormonal surges and insulin resistance in the morning hours.
- The carbohydrate allowance for breakfast is limited to two choices (30 grams) to help promote optimal blood glucose levels.

Consistence Carbohydrate Diet

Table 6.3 Suggested Menu Plan for Gestational Diabetes ~2000 Calories

(Select from foods described)

Breakfast: Two carbohydrate choices (30 grams)

- 1 slice whole wheat toast (1 choice)
- 1 egg or 1 Tbsp. peanut butter
- 1 tsp. soft margarine
- 8 oz. low-fat milk (1 choice)

Snack: Two carbohydrate choices (30 grams)

- 3 graham cracker squares (1 choice)
- 8 oz. fat-free milk (1 choice)

Lunch or Supper: Three to four carbohydrates (45–60 grams)

- 2 slices bread (2 choices)
- ½ medium banana (1 choice)
- 6 oz. light yogurt (1 choice)
- 1 c. carrot and celery sticks
- 2-3 oz. roast beef
- 2 tsp. soft margarine

Snack: Two carbohydrate choices (30 grams)

- 3 c. popcorn, lower fat (1 choice)
- 1 c. cantaloupe (1 choice)
- 1 unsweetened beverage

Consistence Carbohydrate Diet

Dinner: Three to four carbohydrates (45–60 grams)

3 oz. chicken breast

1 small baked potato (1 choice)

½ c. broccoli

½ c. peaches (1 choice)

1 small dinner roll (1 choice)

8 oz. fat-free milk (1 choice)

1 tsp. margarine

Snack: Two carbohydrate choices (30 grams)

6 whole wheat crackers (1 choice)

1 oz. cheese

8 oz. fat-free milk (1 choice)

Hypoglycemia

- **Hypoglycemia**

- caused by taking too much diabetes medication.
- eating too few carbohydrates at meal time.
- skipping meals, or getting more exercise than usual.

- **Common signs**

- feeling shaky, sweaty, tired, hungry, confused, rapid heart rate, blurred vision or headaches, and numbness or tingling in the mouth and lips.
- In severe cases, the person may lose consciousness.

Hypoglycemia

- **Treatment**

- “Rule of 15.”
- This means once a low blood sugar is recognized, 15 grams of carbohydrate are given.
- It is recommended to use only carbohydrate to treat hypoglycemia and not to use high fat or protein food.
- **Why ?**

Protein can stimulate the pancreas to release insulin and does not prevent a repeat low blood sugar. Fat slows down the absorption of carbohydrate leading to a delay in raising blood glucose.

Hypoglycemia

- The blood sugar should be rechecked in 15 minutes.
- If the blood sugar remains low, then retreat with 15 grams of carbohydrate.
- Recheck the blood sugar again in 15 minutes and repeat as necessary until the blood sugar is within normal limits.

- **Examples:**

Table 6.5 Treatment of Low Blood Sugar "Rule of 15"

<i>Good Choices</i>	<i>Poor Choices</i>
15 gram carbohydrate portions	
½ cup fruit juice	Donuts
4 glucose tablets	Ice cream
½ cup regular soda	Candy bars
1 cup fat-free or low-fat (1%) milk	Sandwiches
1 Tbsp. honey	Pies, cakes, cookies
1 Tbsp. sugar	Milkshakes

Type 1 Diabetes/ Insulin Dependent

Type 1 Diabetes/ Insulin Dependent

- Multidisciplinary team is needed.
 - Dietitian
 - Diabetes nurse
 - Physicians
- Control the complications and maintain glucose level.

Type 1 Diabetes/ Insulin Dependent

- Management of type 1 diabetes comprises a package of measures including:
 - Multiple daily injections.
 - Assessment of glycaemic control
 - ✓ blood glucose self-monitoring
 - ✓ glycated haemoglobin (HbA1c)
 - Insulin dosage adjustment according to diet and exercise
 - A healthy diet and carbohydrate counting
 - Intensive diabetes education.

Type 1 Diabetes/ Insulin Dependent

Injection sites

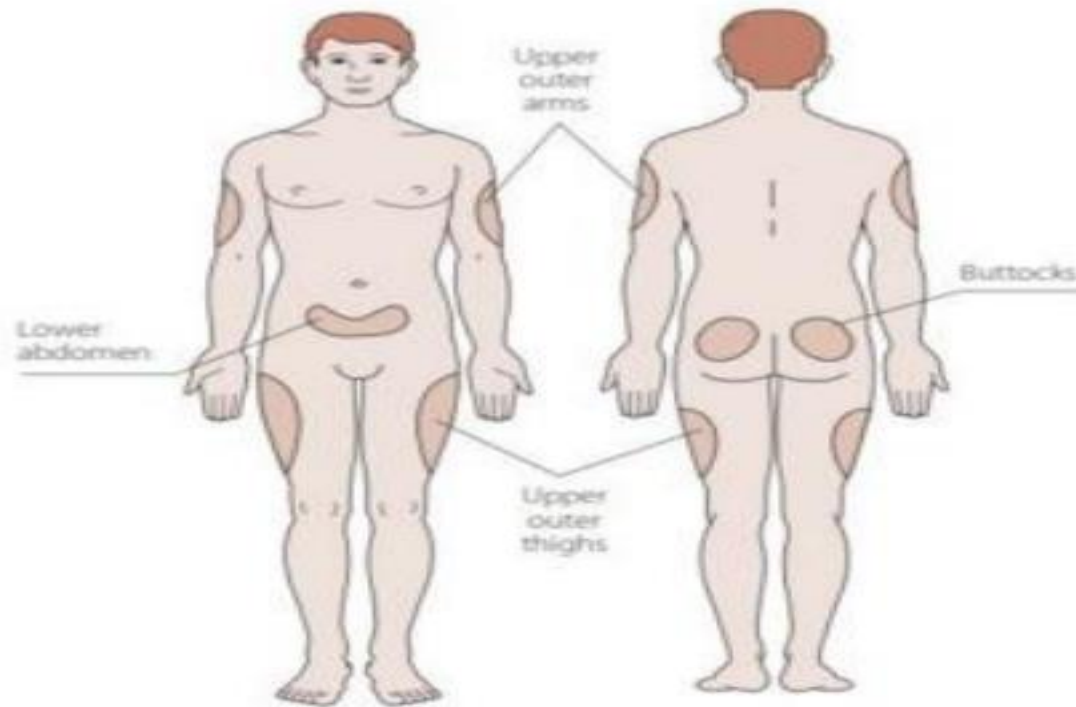


Figure 10.6 Suitable sites for

Type 1 Diabetes/ Insulin Dependent

- Important calculations for type 1 diabetes patients:
 - **Insulin CHO/ Ratio.**
 - **Mealtime Dose.**
 - **Correction Dose**
 - **Total Insulin Dose/ meal.**
 - **Basal Insulin Dose.**
 - **Total Daily Insulin Dose (TDID).**

Type 1 Diabetes/ Insulin Dependent

- 1 unit of insulin cover 15 g of CHO

Example

- 60 grams of CHO in a meal
 - Your Insulin/CHO ratio is for example 1:12
 - CHO insulin dose = $60 \text{ g} \div 12 = 5 \text{ units}$
- You will need 5 units of insulin to cover the carbohydrate you eat at the meal.

Type 1 Diabetes/ Insulin Dependent

- **Correction Dose (CD)**

- **1 unit of insulin** is needed to **drop** the **blood glucose** by **45 mg/dl**.
- So the correction dose is **1 unit of insulin** for every **45 mg/dl** of blood glucose **above the target level**
- Correction dose **can range from 30-100 mg/dl or more**, **depending** on individual **insulin sensitivity**, and other circumstances

Type 1 Diabetes/ Insulin Dependent

Example

- Your actual **pre-meal** blood sugar is: 210 mg/dl.
- Pre-meal blood sugar **target** is: 120 mg/dl.
- **Difference** is: 90 mg/dl
- **Correction** insulin **dose** is: $90/45 = 2$ units

Type 1 Diabetes/ Insulin Dependent

- Total meal insulin dose =
 - CHO intake insulin dose
 - + high blood sugar correction dose
- Example:
 - CHO coverage dose (5 units)
 - + high sugar correction dose (2 units)
 - total meal dose (**7 units**)
- The **TOTAL MEALTIME INSULIN DOSE** is **7 units** of insulin

Type 1 Diabetes/ Insulin Dependent

- Total Daily Insulin Dose (TDID)
- Total Daily Insulin Requirement (in units of insulin) =
 - **0.55 x Weight in kilograms**
- **Or**
 - **Weight in Pounds ÷ 4**

Type 1 Diabetes/ Insulin Dependent

- Example:
- Weight: 73 kg
 - $73 \text{ kg} \times 0.55 = 40 \text{ unit}$ of insulin/day
- Weight : 160 lb.
 - $160/4 = 40 \text{ units}$ of insulin/day
- ✓ Insulin dose may be \uparrow **or** \downarrow depending on body's reaction whether **resistant or sensitive** to insulin.
- ❖ Individual needs are best assessed by **physician**

Type 1 Diabetes/ Insulin Dependent

- 40-50% ($\approx 45\%$) of **TDID** (Total Daily Insulin Dose)
- For someone whose weight is 160 lbs.
- **TDID** = 160 lbs. $\div 4 = 40$ units.
- **TDID** = 73 kg $\times 0.55 = 40$ **unit**.
- **Basal insulin dose** (if we use the 45% level) =
 - 45% of TDID (40 units) = 18 units
 - $40 - 18 = \underline{22 \text{ units}}$ to cover meals and correction dose

Assignment 5 & 6

- **Type 1 & 2 diabetes assignment should be submitted in on Wednesday 18th May 2022.**