NUTRITION BASICS AND A QUICK GUIDE TO CARBOHYDRATE COUNTING

Medtronic
Further, Together

Authored by

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CHAPTER 1

Introduction to Healthy Eating

When one is diagnosed with diabetes, the first thing that comes to mind is that you have to give up on your favourite foods. Not true!

It is not what you eat but how much you eat that matters!

The good news is that there is no diabetic diet. Eating a balanced, healthy meal and making wise choices when eating out is not only beneficial to a person with diabetes but for everyone.

Helpful Tip

Moderation is the key to good health

Where do I start?

- Eat from a variety of foods from all the food groups to ensure you get the right nourishment for your body
- Portion control is key. Aim for moderate and consistent portions of food at each meal
- If you need a snack or a fruit, space it approximately 2-3 hrs before or after a meal
- Avoid skipping meals
- Eat when you are hungry, not starving. Stop when you feel full
- Breakfast is a must; try to have two thirds of your calories before dinner
- Increase the amount of fiber in your meals
- Drink lots of water through the day
- Go slow on salt and sugar
- Trim the fat
- If you choose to drink alcohol, limit the amount and drink it with food to prevent hypoglycemia
- Look for opportunities to increase your daily physical activity. 150 mins / week of moderate intensity aerobic physical activity is recommended
- Know your targets and make an effort to achieve them; body weight, BMI, blood glucose, blood cholesterol and blood pressure

Rather than focusing on the foods you need to restrict, think about all the delicious choices you can make

CHAPTER 2

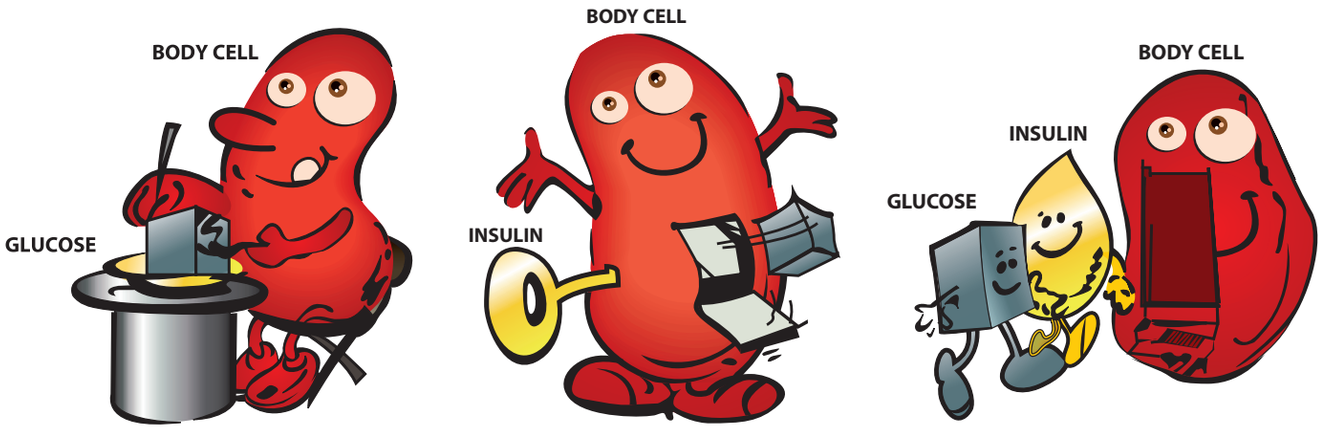
What is the connection between Food and Diabetes?

The food that you eat is broken down into glucose. Glucose is the main source of energy to our body similar to what petrol is to a car. The presence of glucose in the blood causes blood sugar levels to rise and signals the pancreas to release the hormone insulin.

Insulin is like a key which opens the lock of the cells, allowing glucose to enter in and get converted into energy

In the absence of Insulin, glucose cannot enter the cells resulting in high blood sugar levels. The body is deprived of the energy it needs to carry out its daily functions.

High blood glucose levels over time affects every vital organ in the body (kidney, eyes, heart, nerves etc) and can cause life threatening complications.



If you have **Type 1 diabetes**, your body produces little or no insulin at all, so glucose stays locked out of your cells. If you are on insulin, meal timings become very important.

If you have **Type 2 diabetes**, your body does make insulin - but there may be a problem. You might not make enough of it, or there may be a defect preventing it from helping glucose enter your cells. People with Type 2 diabetes may be managed on diet and exercise alone, or put on oral medication or started with insulin.

If you are overweight, you must follow a meal plan which helps you to lose weight. Weight loss makes it easier to control your blood sugar, and so does a regular eating schedule.

Quiz Time 1

Q1. _____ is the main source of energy to our body.

Q2. Insulin is a _____ which helps blood glucose levels stay in the normal range.

Q3. In Type 1 Diabetes, the body produces _____ insulin.

Answers on Page 75

CHAPTER 3

Knowing your Food Groups

Foods contain nutrients that are needed by your body for good health. There are three main nutrients that make up food and contribute calories- **Carbohydrate, Protein, and Fat.**

C

P

F

NUTRIENT GROUPS	CARBOHYDRATES *Primary Fuel Source*	PROTEINS *Building Blocks*	FATS *Energy Dense*

C Carbohydrates

- They are the preferred and main source of energy for body functions
- Carbohydrates are of three types: **complex, simple and refined**

GOOD CARBOHYDRATES		BAD CARBOHYDRATES
Complex Carbohydrates (Good Carbohydrates)	**Simple Carbohydrates**	**Refined Carbohydrates**
They are packed with fiber, vitamins and minerals. The body takes longer and has to work harder to break down these foods into energy. Include foods rich in complex carbohydrates as they give you sustained energy and keep you full longer and active throughout the day. **Sources:** Whole grain cereals - unpolished rice, whole wheat, oats, broken wheat (daliya), barley, buckwheat, millets, whole pulses and sprouts - soybeans, root vegetables, etc.	They are digested quickly by the body. When taken in small amounts, they give your body an immediate energy boost. Best to correct a hypoglycemic event. If you have a fruit juice, it will take only about fifteen minutes for the sugar to enter your blood and cause a spike in blood glucose levels. **Sources:** Milk, fruits, fruit juice, honey and some vegetables.	The body processes refined carbohydrates quickly making your blood sugar rise and fall rapidly. The higher the food is in refined sugar, the worse it is for you as it offers very little nutritional value to your body. **Sources:** Polished rice, white bread, white pasta, maida /refined flour and its products, aerated drinks, candy, artificial syrups, sugar. Junk food: Burger, pizza, samosa, vada etc, pastries and desserts. Bakery items: Biscuits, breads, cookies, puffs etc.

Foods having no or negligible carbs (0-5 g).
They have very little impact on blood glucose levels.

No or negligible Carbohydrates (0-5 g carbohydrates)

- All vegetables
- Green leafy vegetables
- Nuts
- Spices
- Eggs
- Seafood
- Meat and poultry
- Fats (Oil, butter and ghee)
- Cheese

▪ Impact of Carbohydrates on blood glucose:

Carbohydrates by far have the greatest short-term impact on your blood glucose levels more than protein or fat.

Blood glucose levels begin to rise after fifteen minutes of eating and most of the carbohydrate is broken down into blood glucose within the first two hours of eating.

The rise in blood glucose levels will depend on the amount (g) and the type of carbohydrate (complex, simple, refined) you eat.

The more carbs you eat, the more insulin you will need, therefore for people with diabetes, carbohydrate counting is absolutely necessary and the key to maintaining tight control over your blood glucose level.

Just because you're going to count carbohydrates does not mean you can't eat them! In fact, if you eat a well balanced diet, half the calories you eat (50-60%) will come from Carbohydrates. Restricting the total carbohydrate intake to <130 g/day is not recommended as the brain needs that much to function at its best.

Helpful Tip

As a rule of thumb, opt for whole foods rather than refined and processed foods

Fiber

Fiber cannot be digested by the body and hence does not provide any calories. It keeps you full longer, aids in weight loss and helps prevent constipation.

- ## Impact of Fiber on Blood Glucose :

  Though considered a carbohydrate like starch or sugar, fiber does not raise blood glucose levels. In fact the presence of fiber can slow down the impact of other carbohydrates in a meal.

- ## Recommended intake (25-35 g/day)

  Ideas for increasing fiber intake include:

  - Choose whole fruits over fruit juices
  - Opt for brown rice and whole-grain / multigrain products instead of white rice and refined flour
  - Choose whole-grain, high fiber cereals for breakfast
  - Much on raw vegetables like cucumber, carrot, radish and tomatoes
  - Include sprouts and unstrained soup in your diet

Sources:
Whole wheat, brown rice, jowar, bajra, bran, barley, bulgar wheat (daliya), rolled or whole oatmeal, whole grains, corn, vegetables, sprouts, peas, soyabean, guar, fenugreek, beans, carrots, apples, guava, citrus fruits, strawberries, figs, prunes, pear, etc.

Proteins

Proteins are the building materials of the body responsible for growth, maintenance and energy. On an average an individual needs 0.8–1.0g of protein per kg Ideal body weight. This may vary depending on several factors.

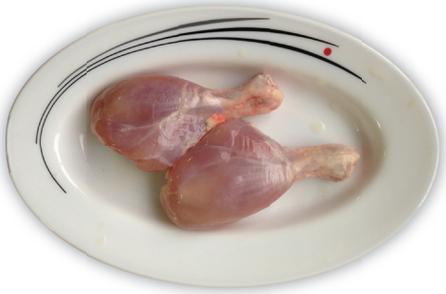
Sources of protein include milk and milk products, dals, sprouted pulses (chana, moong, matki, rajma), soyabean, egg, meat, fish, chicken and nuts.

For those of you vegetarians, who find it difficult to meet your protein intake, milk, yoghurt, buttermilk, whey water, hung curd, low fat paneer, cheese, soyabean and tofu are an excellent source of high quality protein and must be included in your meal plan.

SOURCE	AMOUNT	PROTEIN CONTENT
Milk	150 ml (1 cup)	4.8 g
Curd	100 g (5½ tbsp*)	3.2 g
Paneer (cottage cheese)	50 g	9.4 g
Cheese	25 g (1 cheese cube)	5.8 g
Greek Yogurt	100 g	8.2 g
Pulses (moong, rajma, chana)	30 g (1 fistful)	7.0 g
Soybean	25 g	9.2 g
Soya chunks	30 g (¾ cup)	15 g
Soy paneer (Tofu)	100 g	7.7 g
Egg	1 whole / 2 whites	6.5 g
Chicken / Fish / Mutton	100 g	18-20 g

**tbsp (Table spoon)*

Meeting your protein requirements



100 g Chicken and Fish

50 g Paneer (cottage cheese)

Helpful Tip

Choose low fat protein sources like lean meat, sprouts, egg whites, low fat milk, yoghurt and defatted soya to meet your protein requirements

▪ Effect of protein on blood glucose levels:

Protein eaten in small portions has little effect on blood glucose levels.

But if you eat large amounts of protein in a meal (3 servings of protein = 3 x 7 g of protein / serving = 21 g of protein)*, it may delay the absorption of carbohydrate and cause the sugars to increase for up to a few hours after the meal. Frequent blood glucose monitoring in such situations is recommended.

**If you eat more than 120 g fish/chicken (thicker than a deck of cards and larger than the palm of your hand)*

Fats and Oils

Although fats have earned the bad reputation of causing weight gain and other ill effects, some fat is essential for survival. Out of the total calories, 20-30% should come from fat.

Facts about Fats & Oils

- The biggest problem with food is high amount of fat used in cooking
- No fat or oil is "totally safe" and can be consumed in unlimited quantities. Any fat or oil you eat (healthy or unhealthy) is a dense source of calories.
- All vegetable and seed oils are "cholesterol free". Cholesterol is present only in animal foods
- A blend of two or more vegetable oils should be used in daily cooking
- Deep or shallow fried foods should be avoided
- The total cooking oil/fat intake should be restricted to 15-20g per day / person which is about 3-4 tsp / person / day. The amount of oil to be used may vary from person to person and can be decided by your nutritionist / dietician.

**tsp (teaspoon)*

HEALTHY FATS		
Unsaturated fats found in many vegetable oils and seeds do not raise blood cholesterol levels and have a protective effect on the heart. Even though considered healthy ,healthy fats are still high in calories. They can be made part of a healthy diet, as long as you do not exceed your total fat allowance.		
Monounsaturated Fats (MUFA):	**Polyunsaturated Fats (PUFA): Omega-6**	**Polyunsaturated Fats (PUFA): Omega-3**
Decreases LDL (bad) cholesterol **Sources:** Avocado, Olive oil, Groundnut oil, Canola oil, Rice Bran Oil, Nuts, Olives, Nuts, Sesame seeds.	Decreases LDL (bad) cholesterol and improves insulin action. **Sources:** Safflower, Sunflower, Cottonseed, Corn, Soyabean oil, Groundnut, Ricebran and Sesame oil.	Reduces Triglycerides and Stickiness in blood **Sources:** Soyabean, Canola/Rapeseed and Mustard oils, pulses like Black Gram (kala chana), Kidney beans (rajmah) & Cowpea (lobia), Mustard and Fenugreek seeds and green leafy vegetables, fish like Mackerel, Sardines, Tuna and Salmon.

UNHEALTHY FATS		
They raise blood cholesterol levels and put you at an increased risk for Obesity, Diabetes, Heart Disease and Cancer.		
Saturated Fat	**Trans Fats**	**Dietary Cholesterol**
Restrict foods with too much saturated fat as they raise 'bad cholesterol' levels in your blood. Saturated fats should be restricted to <10% of the total energy and <7% in those with deranged lipid profile*. **Sources:** Butter, cheese, whole milk and cream, egg yolks, lard and skin of poultry, red meat and processed meat like sausages, ham and bacon, coconut oil, cocoa butter and palm kernel oils.	Eat foods with as little trans fat as possible (less than 1 % of total energy). Trans fats should be preferably totally avoided. **Sources:** Bakery products, margarine, vanaspati / dalda, ready to eat (processed) foods, deep fried foods like samosas, bhajias, french fries, chips, sweets like jalebis, gulab jamuns, etc.	Restrict the dietary cholesterol intake to less than 200 mg / day. There should be restricted intake of foods which have cholesterol. **Sources:** Milk and milk products, butter, ghee, egg yolks, liver, brain and other organ meats, red meat and poultry.

**ICMR 2018*

Helpful Tip

Look for words such as "shortening," "partially hydrogenated vegetable oil," or "hydrogenated vegetable oil" in the ingredients. These words are clues that the food contains trans fat.

▪ Frying and Reheating of Oils

For frying, use oils which have more stability and a high smoke point. The common practice of repeatedly using the same oil for frying is hazardous to health.

Helpful Tip

It is advisable not to reheat oils. The oil once used for frying can be used for cooking; for example to give tadka to the dal

▪ Use of Cooking sprays

Cooking sprays are easily available in the market today and a good option for non stick cooking instead of butter, oil or shortening. It can be sprayed on the pan, baking or microwave dish. They are calorie free and fat free.

▪ Effect of fat on blood glucose levels:

Fat has a minimal effect on blood glucose levels similar to protein. However, if fat is present in high amounts; it can slow down the breakdown of carbohydrate from the meal causing your blood glucose to rise much later.

The best example is of ice-cream. If you eat an ice-cream and test blood glucose after two hours, chances are that you will not see a spike in blood glucose levels, however if you test after a few hours, blood glucose levels may be higher.

Hence monitoring in case of a high fat meal is recommended for up to 4-6 hours after consuming the meal.

Quiz Time 2

Q1. **Place a check mark ☑ next to the foods that contain carbohydrate**

a. Honey	☐	**f.** Diet Coke	☐
b. Olive Oil	☐	**g.** Fish	☐
c. Egg	☐	**h.** Corn	☐
d. Burger	☐	**i.** Moong Sprouts	☐
e. Green Tea	☐	**j.** Dal	☐

Q2. **25 gms of soya has _____ gms of protein whereas 100 gms of fish has _____ grams of protein**

Q3. **State whether the following statements are true or false**

a. Low carb diets (130gms/day) are advised for people with diabetes. _____

b. Honey and jaggery are advisable for people with diabetes whereas sugar is not. _____

c. Carbohydrates have the greatest short term impact on blood glucose levels. _____

Q4. **List three foods you eat which fall into the following groups**

a. Carbohydrates;

b. Protein;

c. Fat;

Q5. **In the blank next to the foods listed, write an "S" for Simple Carb or "C" for Complex Carb**

a. Fruit	_____
b. Oatmeal	_____
c. Honey	_____
d. Brown Rice	_____
e. Corn	_____
f. Fruit Juice	_____

Answers on Page 75

Sugar Substitutes

i. Artificial Sweeteners

Artificial Sweeteners are similar to sugar in taste but do not provide any calories. They do not have any effect on blood glucose levels.

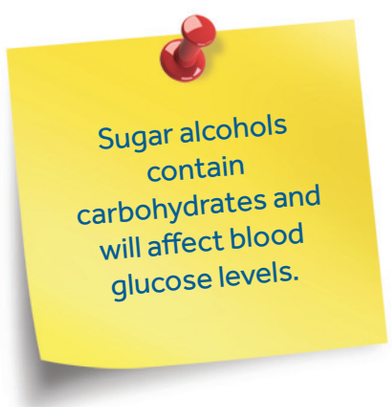
Examples are saccharin, aspartame, sucralose, acesulfame-k, stevia and cyclamate. They are generally considered to be safe to use if consumed in moderation.

ii. Sugar Alcohols

Sugar alcohols are like sugar in some ways, but they are not completely absorbed by the body and hence provide fewer calories. Because of this, the blood glucose impact of sugar alcohols is lesser than that of sugar.

Sugar alcohols should be taken with caution as studies have shown that consumption of foods high in sugar alcohols can cause diarrhea in people with diabetes

Examples are mannitol, sorbitol and xylitol which are used as sweeteners in a variety of products like bakery goods, chewing gum, ice cream and candy.



Helpful Tip

If a product contains a Sweetener, it does not mean it is carbohydrate free. Check the food label on foods marked "diet", "light" or "sugar free" to check which sweetener is used and the total carbohydrate content.

Alcohol

- Alcohol provides empty calories (7cals/g) and should be avoided.
- If you choose to drink alcohol, do so in moderation (not more than one or two drinks).
- Choose low carbohydrate drinks . Avoid beers, sweet wines, liquers and cocktails
- Make sure you eat something to prevent your blood glucose levels from going low.
- Additional blood glucose testing (especially at night) is recommended when consuming alcohol

Note: *There can be a great deal of variability with beers and wines, as many factors contribute to the carbohydrate content of the final product. The following are averages only.*

	QUANTITY	CARBS	CALORIES
Light beer	12 fl oz (354 ml)	3-7 g	100
Regular beer	12 fl oz (354 ml)	13 g	150
Strong beer	12 fl oz (354 ml)	13 g	180
Breezer	12.2 fl oz (360 ml)	39 g	220
Whisky	30 ml	Trace	66
Gin	30 ml	Trace	66
Brandy	30 ml	Trace	66
Rum/Bacardi	30 ml	Trace	66
Vodka	30 ml	Trace	66
Red wine	100 ml	1.6 g	70
White wine (Dry)	100 ml	Trace	65
White wine (Sweet)	100 ml	4 g	90
Rose wine	100 ml	2.4 g	62
Champagne	100 ml	3.3 g	83
Port wine	100 ml	12 g	150
Martini	100 ml	Trace	208
Baileys Irish Cream	1.5 fl oz (44 ml)	11 g	144

Quiz Time 3

Q1. State whether the following statements are true or false

a. Sugar alcohol do not raise blood glucose levels. _____

b. One can take any amounts of artificial sweeteners. _____

c. It is important to test your blood glucose levels frequently when drinking alcohol especially at bedtime. _____

Answers on Page 75

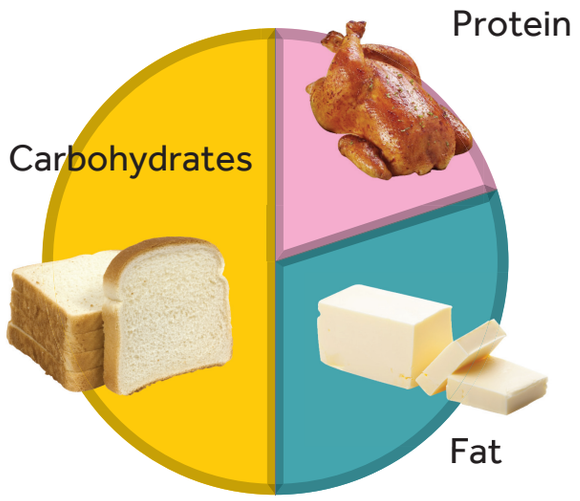
CHAPTER **4**

How many calories do the Nutrients Contain?

1 gram of carbohydrate = 4 calories
1 gram of protein = 4 calories
1 gram of fat = 9 calories

Carbohydrates, Protein and Fats contribute calories to the diet. A balanced diet should provide around 55-60 % carbohydrates, 12-15 % proteins and 20-30 % fat*

Example: If you are a 5'8" (173 cm) tall man weighing 72kg and consuming approx 2000 calories / day



55-60% carbohydrate	=	**1100 calories or 275 g**
12-15% Protein	=	**300 calories or 75 g**
20-30% Fat (visible + invisible)	=	**500 calories or 55 g**

**ICMR 2018*

However there is no ideal percentage of calories coming from these nutrients.

Their distribution in the diet should be based on an individualized assessment of current eating patterns, preferences and health goals. A registered Dietician can help plan a balanced diet with right amount of nutrients for you.

Helpful Tip

As fat contains more than twice the calories (9 cals) per gram of either protein (4 cals) or carbohydrate(4 cals), those trying to lose weight should limit the fat intake.

A Registered Dietician (RD) can help plan a balanced diet with the right amount of nutrients for you.

CHAPTER 5

Be a Detective: Read Food Labels

Just about every packaged food available today has a food label indicating serving size and other nutritional information. So the next time you are at the grocery store, take out that extra minute to read the food labels of the items you're buying. Reading the label is the only way to make wise food choices and meet your health goals.

A Serving Size:

It is important that you pay attention to the serving size, especially the number of servings in the package and compare it to how much you actually eat. For example, if you ate 80 g cereal, that means you have eaten two servings (double the carb, fat and protein per serving).

B Total carbohydrates:

This is the amount of carbohydrate per serving. In this food label, the total carbohydrate mentioned is 37.1 g per serving

Sugar:

It is included in the total carbohydrate amount. Keep a check on the amount of carbs coming from sugar. This number must be as low as possible. Compare different brands and products and choose the ones with the lowest number of sugar grams per serving.

Fiber:

When counting total amount of carbohydrates, subtract the fiber grams from the total grams of carbohydrate for a food containing fiber. This will give you net carbohydrates per serving.

No of Servings you are eating = _____

Total carbohydrate grams per serving X the no of servings you are eating = The total grams of carbs you are eating

Eg: if you eat 2 servings of this cereal (1 serving = 37.1 g carbs, 2 servings = 74.2 g)

Nutrition Information

	Typical Value for 100g	40g serving with 120ml of skim milk (A)
Energy	**365 kcal**	**181 kcal**
Energy From Fat	41 kcal	17 kcal
Total Fat	**4.5 g**	**1.9 g**
Saturated Fatty Acids	0.6 g	0.3 g
Monounsaturated Fatty Acids	1.9 g	0.8 g
Polyunsaturated Fatty Acids	1.1 g	0.4 g
Trans Fatty Acids	0.0 g	0.0 g
Cholesterol (B)	**0 mg**	**0 mg**
Total Carbohydrates	**79.0 g**	**37.1 g**
of which Sugar (Sucrose)	11.2 g	4.5 g
Dietary Fibre	6.5 g	2.6 g
Protein	**8.5 g**	**6.4 g**
Sodium	**0.2 g**	**0.6 g**

			(%RDA)
Vitamin A	100 µg	45 µg	8%
Vitamin C	25 mg	11 mg	28%
Thiamine (Vit B1)	0.8 mg	0.3 mg	30%
Riboflavin (Vit B2)	0.9 mg	0.4 mg	32%
Niacin (Vit B3)	10.0 mg	4.1 mg	34%
Vitamin B6	1.3 mg	0.5 mg	25%
Vitamin B12	0.2 µg	0.7 µg	68%
Folate	63.0 µg	25.0 µg	13%
Iron	14.0 mg	5.8 mg	28%

#Approximate values

If cereal is had with cow's milk, the energy value will increase by 46 kcals and the fat by 4.8g.

Skim Milk Nutrient Values: From 'Nutritive Value of Indian Foods', NIN ICMR except for Fat, Sodium, Vitamin A & Vitamin B12 (Source USDA)

% RDA (Recommeded Dietary Allowance) per day for sedentary women basis Nutrient Requirements &

(C) **Ingredients:** Multigrain (Wheat - 25.2%, Corn grits - 15.8%, Rice - 10.1% , Rolled barley - 8.2%, Rolled oats - 8.2%), Fruits (Dried Papaya - 4%, Dried Apple - 3.3%, Dried Peach - 3.3% Dried Dates - 3.3%, Raisins - 3.3%), Sugar, Almonds - 5%, Malt extract, Iodized salt, Vitamins, Minerals and Antioxidant (INS 320)

CONTAINS ADDED FLAVOUR (ARTIFICIAL FLAVOURING SUBSTANCES)

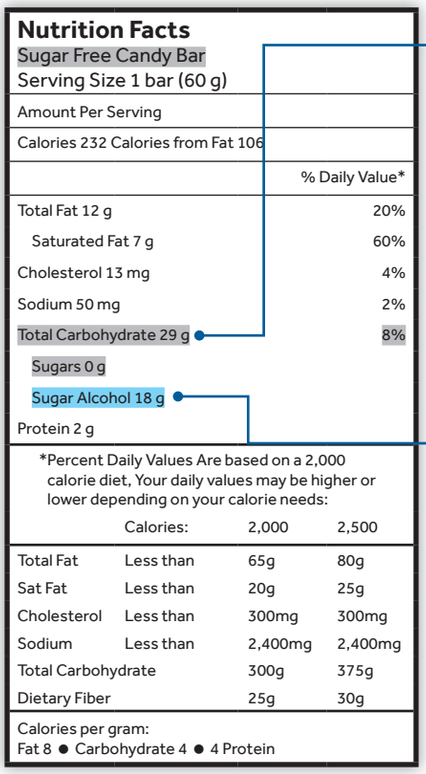
Contains Gluten, Almond (Tree nut), Sulphite*

*Some dried fruits contain sulphite to maintain color.

PROPRIETARY FOOD

C Ingredients:

Each product lists the ingredients on the label. They are listed from largest to smallest amount (by weight). This means a food contains the largest amount of the first ingredient and the smallest amount of the last ingredient.



Nutrition Facts
Sugar Free Candy Bar
Serving Size 1 bar (60 g)

Amount Per Serving	
Calories 232 Calories from Fat 106	
	% Daily Value*
Total Fat 12 g	20%
Saturated Fat 7 g	60%
Cholesterol 13 mg	4%
Sodium 50 mg	2%
Total Carbohydrate 29 g	8%
Sugars 0 g	
Sugar Alcohol 18 g	
Protein 2 g	

*Percent Daily Values Are based on a 2,000 calorie diet, Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 8 ● Carbohydrate 4 ● 4 Protein

The total carbohydrate tells how many grams of carbohydrate are in one serving. It includes the carbohydrate in fiber, sugars and sugar alcohols

Look for the names of the individual sugar alcohols on the ingredient list of any product that contains them. They will be included in the amount of carbohydrate on the label, either in the total or on a separate line for sugar alcohols. If the product is labeled "sugar-free" or "no added sugar," the manufacturer must show the sugar alcohol count separately.

Sugar alcohol is INCOMPLETELY absorbed. Estimate that only half of the sugar in sugar alcohol will be absorbed and impact your blood sugar.

In this example the total carbohydrate per serving will be 29 g.
MINUS ONE HALF (1/2) the carbohydrate in the sugar alcohol.
One half of the sugar in the sugar alcohol per serving is:
18 g CHO ÷ 2 = 9 g of CHO

So the TOTAL CARBOHYDRATE PER SERVING is:
29 g CHO – 9 g CHO (for the sugar alcohol) = 20 g CHO

A free food is any food or drink that contains less than 20 calories or less than or equal to 5 grams of carbohydrate per serving.

Examples include salads with mustard / lemon dressing, plain tea, green tea or coffee without milk or sugar, unsweetened lemon juice, vegetable juices, clear soups without seasoning and diet sodas.

Label Claims

I can eat as much sugar free food as I want, right?

Not really! In fact, some sugar-free foods have the same amount of calories and carbohydrates and sometimes more fat than nonsugar-free options. Therefore, make sure you read the labels

Sugar free food has less than 0.5 g of sugar per serving. However 'Sugar Free' does not mean carb, calorie or fat free. When manufacturers remove sugar, they often add fat to the product making it higher in fat content than the product with sugar. It is advisable to check the food label on the product for the total carbohydrate and fat content before consuming it.

Usually products marked as **low fat or fat free** have less than 3 g of fat per serving. In order for the fat-free food to maintain its taste, the fat has to be replaced by either sodium, sugar, or something else that will give it a similar flavor and texture. Which means fat-free foods can have more carbohydrates and contain nearly as many calories as the standard version of the same food. This can be detrimental to your sugars. Make sure you read the food label before buying the product.

Amount / Serving	% Daily Value*
Total Fat 0g	**0%**
Saturated Fat 0g	**1%**
Trans Fat 0g	
Cholesterol 5mg	**1%**
Sodium 190mg	**8%**
Vitamin A 10% • Vitamin C 0%	
Vitamin D 25%	

Quiz Time 4

Q1. **Using the adjacent nutrition label determine the carb content of the food product.**

1 serving has _____ grams of carbs.

The entire packet (200 g) has _____ g of carbs.

Nutrition Information

Typical Value for 100g | 40g serving with 120ml of skim milk

Energy Energy From Fat	**365 kcal** 41 kcal		**181 kcal** 17 kcal
Total Fat Saturated Fatty Acids Monounsaturated Fatty Acids Polyunsaturated Fatty Acids Trans Fatty Acids	**4.5 g** 0.6 g 1.9 g 1.1 g 0.0 g		**1.9 g** 0.3 g 0.8 g 0.4 g 0.0 g
Cholesterol	**0 mg**		**0 mg**
Total Carbohydrates of which Sugar (Sucrose) Dietary Fibre	**79.0 g** 11.2 g 6.5 g		**37.1 g** 4.5 g 2.6 g
Protein	**8.5 g**		**6.4 g**
Sodium	**0.2 g**		**0.6 g**
Vitamin A	100 µg	45 µg	(% RDA) 8%
Vitamin C	25 mg	11 mg	28%
Thiamine (Vit B1)	0.8 mg	0.3 mg	30%
Riboflavin (Vit B2)	0.9 mg	0.4 mg	32%
Niacin (Vit B3)	10.0 mg	4.1 mg	34%
Vitamin B6	1.3 mg	0.5 mg	25%
Vitamin B12	0.2 µg	0.7 µg	68%
Folate	63.0 µg	25.0 µg	13%
Iron	14.0 mg	5.8 mg	28%

Q2. **The food label shown below is of a packet of Diet Bhel. How much carbohydrate would a 40 g serving of Bhel have?**

Nutritional Information per 100g (Approx)	
Energy value	593 kcal
Protein	5.9 g
Fat	41.5 g
Carbohydrates	48.9 g
Sugar	0.0 g

Q3. **What type of sweetener used in this sugar free chocolate?**

BELGIAN DARK CHOCOLATE WITH SWEETENER
INGREDIENTS: Cocoa mass, sweetener: maltitol, cocoa butter, emulsifier (soy lecithin), flavour (vanilla), Cocoa solids: 53, 9% min. **May Contain traces of cereals containing gluten.**

NUTRITION INFORMATION	Per 100 g
Energy	465 kcal
Protein	5.0 g
Total Fat - Saturated Fat - Trans Fat	36.1 g 22.7 g 0 g
Carbohydrates - Sugars	46.4 g 0.5 g
Sodium	4 mg

Q4. **The total Carbs mentioned is 50 g and there is 7 g of fiber. What is the net carb content of the product?**

Q5. **A free food is any food or drink that contains less than _____ calories or less than or equal to _____ grams of carbohydrate per serving.**

Answers on Page 75

CHAPTER 6

Hand guide to Sensible Servings

Your hands can be a great help when you want to estimate portion sizes of foods and do not have access to the measuring tools.

1

Palm - 3 oz (85 g)
serving of meat, fish, poultry

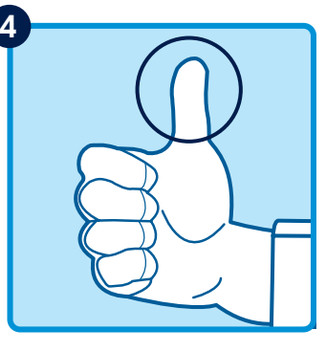
2

Fist -1 cup (240 ml)
serving of cooked vegetables, milk, salads, stews

3

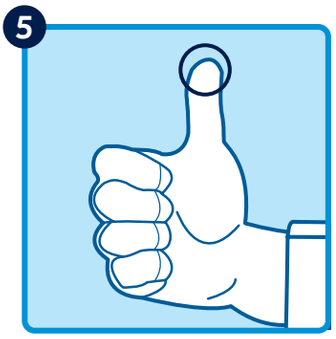
Handful - ½ cup (120 ml)
1 serving of fruit or fruit juice , starchy vegetables, such as potatoes or corn, pinto beans and other dried beans,Rice or noodles, cereal

4



Thumb - 1 ounce (28 g)
1 serving of snack food, cheese (1 slice)

5



Thumb Tip-1 teaspoon (5 ml)
1 serving of margarine or butter, oil mayonnaise

Quiz Time 5

Q1. **Using your hands as a guide can also help you estimate _____ sizes**

Q2. **In each option below, write an example of food you eat where using a hand guide would be useful**

a. Fist _____

b. Handful _____

c. Palm _____

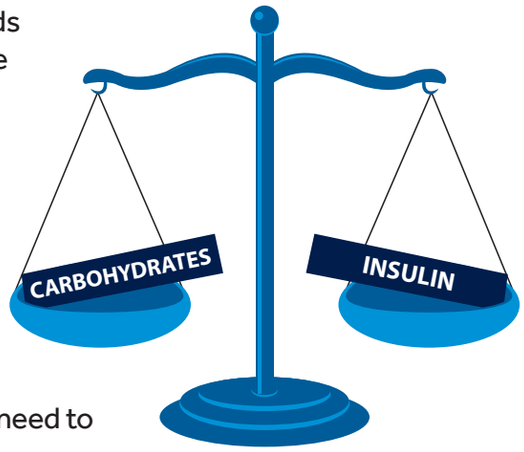
d. Thumb Tip _____

Answers on Page 75

CHAPTER 7

Introduction to Carbohydrate Counting

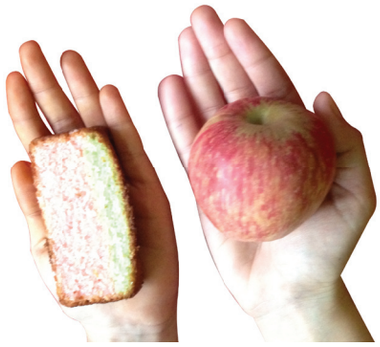
What is Carbohydrate (Carb) counting?



- Carbohydrate Counting is one of best and easiest methods to plan your meals and keep a check on your blood glucose levels. Counting carbs can also offer more variety to your meal plan
- It's the balance between the carbohydrates you eat and insulin you take that determines how much your blood glucose levels will rise after your meal
- Counting carbohydrate servings provides an accurate "guess" of how your blood glucose will rise after a meal or snack. The more Carbs you eat, the higher will be the spike in blood glucose levels and the more insulin you will need to cover that meal
- For example a South Indian meal of idli and dosa will raise blood glucose levels higher than a meal comprising of grilled paneer and salad. Hence you will need more insulin for the South Indian meal

With the right balance of carbohydrates and insulin, your blood glucose level will usually stay in the target range. Carbohydrate Counting helps you reach your blood glucose goals and prevent diabetes complications.

Carbohydrate Counting empowers you to manage your diabetes more effectively matching your own lifestyle, while offering more variety to your meal plan



If you have a choice between a cake and an apple...
What do you choose?

Important Note

Chose the right types of carbohydrates as meals rich in refined carbohydrates provide little nutritional value putting you at an increased risk of obesity and heart disease. The type and amount of carbohydrate is very important in ensuring that blood glucose and serum lipid levels are well within the target range.

How do you count Carbohydrates?

Carbohydrates are measured in grams and may be referred to in grams, exchanges, servings or carb choices. Foods that contain 15g carbohydrates are called 1 carb exchange.

1 Exchange = 1 Choice = 1 Carb = 1 Portion = 1 CP (Carb Portion) = 1 CU (Carb Unit) = 15 g carbohydrate

1 carb choice (15 g Carbohydrates) 

2 carb choices (30 g Carbohydrates) 

But most foods are a mixture of nutrients. So how do you know how much of carbohydrates are there in any given food?

You can check serving sizes with measuring cups, spoons or a food scale to calculate the amount of carbohydrates in the food.

1 tablespoon sugar =1 apple = 1slice of bread = ½ cup oatmeal = 15 g of carbs

For packaged foods, the easiest way is to read the nutrition facts section on the package.

CHAPTER 8

Carbohydrate Counting Methods

One of the most important aspects of counting carbs is knowing how much carbs are there in the foods you are eating. Measuring helps give you a visual idea of how different servings look like on a plate or a bowl.

For example, measure 1 cup of rice onto your plate when you are eating. Once you have done this exercise, you will know how much 1 cup of rice serving looks like on a plate. You will then be able to estimate without having to measure each time.

Important Note

In this module, we have used a food weighing scale and standard measuring cups, spoons and household utensils to show portion sizes for a **15 g carbohydrate exchange of food.** The measuring cups and spoons are easily available in the market and are recommended to be used to standardize Carb portions of foods.

Food Weighing Scale	*Measuring Cups and Spoons*	*Measuring Beaker (calibrated in cups & ml)*
		

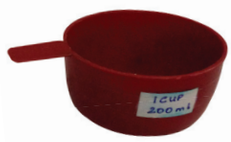
COMMON MEASURES	
3 teaspoons = 1 tablespoon	
4 tablespoons = ¼ cup	¼ cup = 50 ml
5 tablespoons +1 teaspoon = ⅓ Cup	⅓ cup = 80 ml
8 tablespoons = ½ cup	½ cup = 100 ml
16 tablespoons = 1 cup	1 cup = 200 ml

COMMON HOUSEHOLD MEASURES

1 Teaspoon (5 g)

1 Tablespoon (15 g)

1 household katori = 1 dessert bowl = ½ cup = 100 ml



1 soup bowl = 1 cup = 200 ml

Dinner Plate
9 inches Diameter

Quarter Plate
7 inches Diameter

You can use your hand to gauge a healthy portion size. Here are some simple ways to estimate portion sizes based on an average sized woman's hand.

▲
1 Healthy Serving of vegetable
*= **Size of your two open hands***

▲
*1 Serving of cereal and pulses, eg. flour/atta, rice, poha, pasta, pulses, soya others = **Your closed fist***

▲
1 Serving of fish, meat
*= **Your palm size***

◀ *1 Serving of Fruit*
*= **Your fist-size**.*

1 Serving of fat ▶
*= **Your thumb tip-size***

Remember this is just an estimate and will vary depending on the size of your hand.

Important Note

Estimation is great if you do not have access to the right tools, but your chances of success are much greater with the tools.

▪ Packaged Foods

For packaged foods, the easiest way is to read the nutrition facts section on the package. The laws requiring that packaged foods be labeled for their nutritional content are Godsend for people with diabetes! Just check the label on almost any food that comes in a can, box, packet or wrapper and it will give you the total carbohydrate count.

Nutrition Facts	
4 servings per container	
Serving size 11/2 cup (208g)	
Amount per serving	
Calories	**240**
	% Daily Value*
Total Fat 4g	**5%**
Saturated Fat 1.5g	**8%**
Trans Fat 0g	
Cholesterol 5mg	**2%**
Sodium 430mg	**19%**
Total Carbohydrate 46g	**17%**
Dietary Fiber 7g	**25%**
Total Sugars 4g	
Includes 2g Added Sugars	**4%**
Protein 11g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 6mg	35%
Potassium 240mg	6%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to daily diet. 2,000 calories a day is used for general nutrition advice.

An important note: The carbohydrates listed are not for the whole package, but just for one serving - and servings are often smaller than you would expect! Be sure to check the serving size. If you are eating two servings, double the carb count.

In this picture of the food label, total carbohydrate content is 46 g per serving (1 ½ cup-208 g is one serving size). Sugar which is 4 g (2 g natural sugar + 2 g added table sugar) is included in the carbohydrate count of 46 g. Fiber being indigestible carbohydrate, does not raise blood glucose levels. Therefore, when counting carbs, one should subtract the fiber grams from the total grams of carbohydrate to get a more accurate estimate of the carbohydrate content of the packaged food item.

For example, here the food product contains 7 g of fiber in one serving. Therefore one can subtract 7 g from total carbohydrate of 46 g and can consider it to be only 39 g of carbohydrate (net carbohydrates)

▪ Fat and Protein counting

Foods which contain high amount of proteins and fat along with carbohydrate, take a longer time to digest, causing the blood glucose levels to rise much later. Hence, it will be necessary to consider additional dosing of insulin for meals containing more than 20g fat and 30g protein. However, any changes in insulin dosing should be done under supervision of a healthcare provider as different people have different sensitivities to fat and protein.

Examples of food with > 30g protein

Food	Amount	Protein
Non veg Burger	1 no	30-50 g
Chicken (leg pc)	3 no.	30 g
Fish	3 medium pc (>125 g)	25-30 g
Non veg pizza	3-4 slices	30-40 g
Chicken / Mutton curry	1 soup bowl (6-7 pieces chicken)	30-40 g
Paneer	150 g	30g
Cheese	130 g (5 cheese cubes)	30-35 g
Soyabean	80 g	30 g
Soya chunks	70 g	35 g

*For only protein meals with less than 75g protein additional insulin dose may not be required.

Examples of food with > 20g fat

Food	Amount	Fat
French fries	150 g (Medium Size)	25 g
Cheese cake / slice cake / muffins	Single pc	20-30 g
Creamy pasta in white sauce / lasagna	Large Serving	20-40 g
Pizza (14 “)	3 slices	30 g
Burger	1 no	20-65 g

Disclaimer: These are average values of nutrients and may vary based on the method of preparation and ingredients.

CHAPTER 9

Setting Carbohydrate Goals

Carbohydrates are an important part of a healthy diet. The recommended number of servings of carbohydrates is based on your weight, activity level, diabetes medications, and goals for your blood glucose levels. For many people, having 3 or 4 servings of carbohydrate foods at each meal and 1 or 2 servings for snacks works well.

Learn how to follow a consistent Carbohydrate Meal Plan or adjust insulin for carbohydrates to help keep your blood glucose close to target levels.

Example: According to RDA, the energy requirement of a 6 year old boy is 1350 kcal / day

- 1350 calories ÷ 2 = 675 (50% calories from carbohydrates)
- 1 gram carbohydrate = 4 calories
- 675 ÷ 4 = 168 g carbohydrates / day

Break up of Carbohydrates at each meal

Meal	Grams of Carbohydrates	Carbohydrate Choices
Breakfast	30 g	2 choices
Mid morning	15 g	1 choice
Lunch	45 g	3 choices
Mid evening	15 g	1 choice
Dinner	45 g	3 choices
Bedtime snack	15 g	1 choice
Total (11 x 15)	**165 g**	**11 choices**

A Registered Dietician (RD) can help plan a balanced diet with the right amount of nutrients for you. The breakup of carbohydrate will vary depending on the type and dosage of insulin

CHAPTER 10

Carbohydrates in foods

- **Make a note of the below mentioned points before you proceed further**
  1) Each of the illustrations shown below represents 15 g of carbs / 1 exchange of carbs
  2) Illustrations in this section have been shown for home cooked meals
  3) Serving size for both raw/uncooked and cooked version are shown
  4) As you will see, weight and cup /plate size for raw/uncooked and cooked foods differ
  5) Look for the foods you commonly eat and become familiar with the serving size that equals 15 g of carbs
  6) The plate used is a quarter plate (7" diameter)
  7) Disclaimer – The values mentioned in this book are just estimates. Actual amounts may vary depending on many factors, for example portion size, method of preparation etc.

Starch List

This group includes cereals such as wheat, rice, jowar, bajra, ragi, breakfast cereals, bread, biscuits, oats, noodles, pasta, maida, starchy vegetables.

Avoid refined grains like maida, polished rice and white bread and choose healthier options such as whole wheat flour, barley, quinoa, brown rice, multigrain bread, durum wheat pasta etc.

Choose whole-grain and low-fat starches as often as you can.

In general one starch exchange contains

1 serving = 15 g carbohydrates, 1.8 g protein, 1 g fat and 80 calories

White Bread (29 g)

Brown Bread (29 g)

Pav (29 g)

Rusk (2 no.)

Each of the foods shown below represent 15 g Carb exchange

Breakfast Cereals

Muesli (20 g)

Oats (20 g)

Chocos (18 g)

Cornflakes (17 g)

Chapati (Raw weight of atta / flour=23 g)

The size of the chapati, paratha and bhakri will vary depending on its thickness.


Puri (raw weight of atta / flour = 23g)

Aloo Paratha (15 g flour and 21 g potato)

Bhakri (Raw weight = 22 g)

Raw

Cooked

Each of the foods shown below represent 15 g Carb exchange

Raw Rice (Raw weight)= 19 g

Cooked Rice (Cooked weight)= 65 g

Egg Biryani (Raw weight)= 19 g

Pulao (Raw weight)= 19 g

Similar for Chicken and Mutton biryani

Noodles (Raw weight = 23 g)

Raw

Cooked

Poha (Raw weight = 20 g)

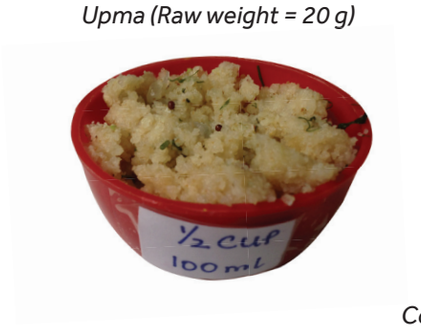
Raw

Cooked

Each of the foods shown below represent 15 g Carb exchange

Upma (Raw weight = 20 g)

Raw



Cooked

Sabudana (Raw weight = 17 g)

Raw

Cooked

Idli & Dosa (Raw weight = 21 g)

Batter

Dosa & Idli

Homemade Idli (7.5 g carbs each)

Restaurant Idli (15 g carbs each)

Idli size will vary from restaurant to restaurant

Starchy Vegetables

Corn	½ cup	Plaintain, unripe	⅓ cup
Corn on the cob	½ cup (15 cm)	Potato, boiled	½ cup (100 g)
Peas	¾ cup	Potato mashed	½ cup

Each of the foods shown below represent 15 g Carb exchange

Potato Vegetable (100 g potato)

Raw

Cooked

Green Peas (130 g)

Sweet Corn (66 g)

Sweet Potato (62 g)

Popcorn (24.6 g Act II)

Jowar Puff (Raw weight = 40 g)

Puffed rice (Raw weight = 20 g)

Makhana (Raw weight = 20 g)

Pulses

On an average, 30 g of pulses give 15 g of carbs, 1 serving = 15 g carbohydrates

Each of the foods shown below represent 15 g Carb exchange

Dal (Raw weight = 30 g)

Raw *Cooked*

Besan / Moong chilla (Moong Dal raw weight = 30 g)

Batter *Cooked*

Usal (Raw weight = 30 g)

Raw *Soaked*

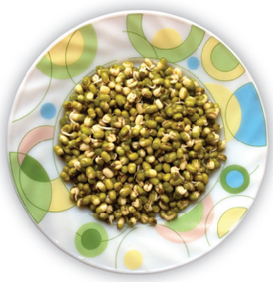
Usal Cooked

Each of the foods shown below represent 15 g Carb exchange

Moong (Raw weight = 30 g)

Raw

Moong Sprouts



Sprouted (quantity doubles as well as the fiber content increases)

Roasted Chana (Raw weight= 30 g)

Important Note

When you eat a meal with a good helping of pulses / sprouts, consider the effect of fiber and protein. There is a slow and sustained release of sugar observed. If on the insulin pump, you can balance the effect of fiber and protein by extending the time of your bolus.

Fruits

- Fruits are an excellent source of vitamins, minerals and fiber which are vital for good health
- Choose from a variety of colorful seasonal fruits
- A whole fruit is preferred over fruit juice as it gives more satiety because of its fiber content
- Commercially available fruit juices may be labeled as "sugar free". This does not mean that it does not contain carbohydrates. Check for the amount of carbohydrate on the food label

Helpful Tip

All fruits are not the same. Some fruits are higher in calories than the others of the same weight. In such cases, you need to keep a check on the portion of fruit you eat. ***Raw or partially ripe fruits are preferable for people with diabetes.***

One serving (exchange) =15 grams of carbohydrate, no protein or fat, and 60 calories

Fruits in the amounts listed below equal one exchange (15 g). Weight includes skin, core, seeds and rind.

Apple, 1 Medium – 100 g	Muskmelon (Yellow) – 300 g
Banana, 1 Elaichi – 65 g	Orange, 1 nos. – 180 g
Black Berries, ¾ Cup – 150 g	Pineapple, 3 – 4 Slices – 150 g
Cherries, Fresh 18 nos. – 150 g	Pear, 1 Medium – 180 g
Figs, Fresh 2 Medium – 100 g	Litchi – 150 g
Grapes, Green, Medium 14 nos. – 120 g	Plums, 2 nos. – 150 g
Guava, Medium 2 – 300 g	Strawberry, Medium 8 nos.
Sapota, 1 Small – 100 g	Custard Apple – 75 g
Watermelon – 300 g	Peach, Fresh 2 Medium – 200 g
Sweetlime, 2 nos. – 300 g	Jackfruit – 100 g
Mango, 1 no. – 120 g	Rose apple (Jambu) – 120 g
Muskmelon (Orange) – 300 g	

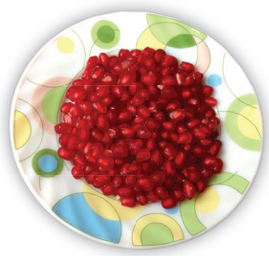
Fruit Juice (unsweetened)

Apple juice	½ cup
Grapefruit juice	½ cup
Grape juice	⅓ cup
Orange juice	½ cup
Pineapple juice	½ cup

Each picture shown below represents edible portion of fruit containing 15 g of carbohydrate

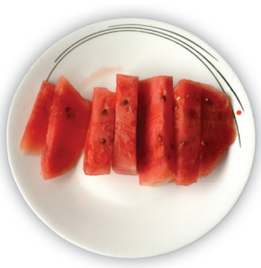
Mango
(120g, small ½ cup cubed)

Pear (180 g, 1 medium)



Pomegranate (130 g, 1 small)

Sweetlime (300g, 2 no.)



Watermelon (300 g, dinner plate, 10" diameter)

Papaya (208 g, quarter plate, 7" diameter)

Apple
(100 g, 1 medium)

Banana (65 g)

Dry Figs (2 nos)

Dried Dates (2 nos)

Apricots (2 nos)

Milk

- Milk and milk products like plain yogurt, buttermilk, cheese, whey water and paneer from the dairy group are excellent sources of high quality protein and calcium. They must be included in your meal plan to ensure strong bones and teeth.

Important Note

While buying yogurt, almond milk, soymilk from the market make sure to buy plain and not flavored as flavored contains added sugar.

Each of the foods shown below represents 10 g of carbohydrates

250 g of Curd -10 g of carbohydrates

120 ml Buffalo Milk - 10 g carbohydrates

200 ml Cow Milk- 10 g carbohydrates

85 g of Paneer - 10 g of carbohydrates

Non Starchy Vegetables

- Non starchy vegetables contain small amounts of carbohydrates and calories, but they are good sources of fiber and micronutrients such as vitamin C, folic acid, B complex vitamins, iron and calcium
- Try and include vegetables, raw or cooked, in your meals, two to three times a day
- Choose more dark green, yellow and red colored vegetables such as leafy vegetables, bell peppers, broccoli and others
- Fill up with vegetable juices, clear vegetable soups, salads, stir fry or some sautéed vegetables

One serving (exchange) = 5 grams of carbohydrate, 1 gram of protein, no fat and only 25 calories.

Important Note

If you eat 1 ½ cups or more of cooked vegetables or 3 cups or more of raw vegetables in a meal, you should count them as one carbohydrate exchange (15 g of carbohydrate).

- Amaranth
- Asparagus
- Baby corn
- Bamboo shoots
- Green beans
- Bean sprouts
- Beets
- Broccoli
- Brussels sprouts
- Cabbage (green)
- Carrots
- Cauliflower
- Celery
- Onions
- Radish
- Peppers, all varieties
- Sauerkraut
- Soybean sprouts
- Spinach
- Summer squash
- Tomato
- Turnips
- Vegetable juice cocktail
- Water chestnuts
- Zucchini
- Cucumber
- Eggplant
- Green onions
- Scallions
- Greens, collard, kale, mustard, turnip
- Leeks
- Mixed vegetables without corn, peas or pasta
- Mushrooms
- Okra (Lady Finger)

Sweets, Desserts and other Snacks

- Try cutting down on "unhealthy food" as much as possible as they contribute large amount of calories from fat and sugar without really providing any nutritional value. These include all chips, bakery foods, candy, soft drinks, fried foods, refined foods like white breads, parathas, naan, doughnuts, khari, nankatais, biscuits, brownies, cakes, etc.
- It is also a good idea to talk to your dietician about how to fit these foods into your meal plan

Helpful Tip

If you choose to eat sweets or desserts, do so in moderation and make sure you do not exceed your calorie and carbohydrate allowance for the day. Balance and moderation is the key here especially if you are watching your weight. This will also prevent your blood glucose from rising.

Here is a guide to common sweets, desserts and other snacks. Remember to include the exchanges in these products as part of your daily allowance.

Each of the foods shown below represent 15 g Carb exchange

Sugar

1 tablespoon (15 g)

Honey

1 tablespoon (15 g)

Jaggery

1 tablespoon (15 g)

Gulab Jamun
(1 no., no sugar syrup, 40 g)

Seviyan Kheer
(15 g sev, 1/3rd cup milk, 5 g sugar)

Motichur ladoo (1/2 no.)

Puran poli
(1/2 no)

Cup Cake
(1 no., edges shaved off)

Rasmalai (1 big / 2 small no., no sugar syrup)

Pudding
(1 small pc)

Disclaimer: This is just a rough estimation

Other Snacks

Each of the foods shown below represent 15 g Carb exchange

Veg Pizza (6" ,1 slice)

French fries (20 nos, ½ serving of McDonald's regular fries)

Dhokla (2 nos)

Khandvi (12 medium pcs)

Muthia (3 small)

Banana chips (20 chips)

Carbohydrate Count for the Most Commonly Eaten Snacks





Menu items	Serving	Total carbohydrate (g)
Pani puri	6 puris	31
Dahi puri	6 puris	31
Aloo tikki	1 patty (100g potato)	15
Bhel puri	1 cup	26
Dahi wada	1 wada	22
Sev puri	5 puris	33
Bread pakoda	1 no.	24
Onion pakoda	4 no.	15
Masala peanuts	50 g	7
Masala matter	30 g	16
Chakli	1 no.	7
Jeera butter	4 nos. (30 g)	15
Khari	1 piece (12 g)	9
Rusk	1 piece (7 g)	8
Cheese sandwich	1 no. (2 bread slices)	22
Grilled sandwich (small, with potato filling)	1 no. (2 bread slices)	30
Veg Frankie/Veg wrap/Roti	1 no.	35
Chicken Frankie/Chicken wrap/Roti	1 no.	25
Veg cutlet	1 no.	15
Samosa	1 no.	30
Vada	1 no.	20

Disclaimer: These are only estimates. Actual amounts may vary depending on many factors, for example portion size, method of preparation, etc.

Nuts & Dry fruits
- 15 g carb exchange

Dates (fresh)	2 nos
Dates Dry	2 nos
Raisins	35 nos
Peanuts	50 nos
Cashewnuts	48 nos
Walnuts	55 nos
Almonds	365 nos
Pistachios	250 nos

Important Note

Nuts and dried fruits are high in calories. Keep a check on the amount consumed.

Biscuits
- 15 g carb exchange

Parle G	4 biscuits
Marie gold	4 biscuits
Good day (cashew, pista badam)	3 biscuits
Good day (butter)	2 biscuits
Priya gold classic cream	3 biscuits
Pickwick	4 biscuits
50-50 maska chaska	7 biscuits
Chocopie	1 pie
Nutri Choice (ragi / oats)	3 biscuits
Bourbon	1 ½ biscuits
Hide and seek	4 biscuits
Dark fantasy	2 biscuits
Oreo	3 biscuits
Mc Vities Digestive	1 ½ biscuits
Cream Crackers	3 biscuits
Monaco	7 biscuits
Pure Magic	2 biscuits
Britannia 5 grain	1 biscuit
Digestive High Fiber	3 biscuits
Jim Jam	2 biscuits
Oatmeal Cookies	3 biscuits
Nice	3 biscuits

Chips

100 g of Frito lays (India's Magic Masala) has 51.4 g of carbs. A medium sized packet of Frito Lays - 51.6 g (17 chips) has 13.4 g of carbs.

You can calculate the Carbohydrate Content of different chips available in a similar manner.

NUTRITIONAL INFORMATION (APPROX.):		
		Per 100g
Energy	kcal	555
Protein	g	6.9
Carbohydrate	g	51.4
Sugars	g	4.1
Fat	g	35.7

Chocolates

65 g (10 pcs) of Cadburys Dairy Milk Silk has 39.3 g of Carbs. This means 1 pc has 3.9 g of Carbs. You can calculate the Carb Content depending on the amount you eat.

You can calculate the Carbohydrate Content of different chocolates available in a similar manner.

Helpful Tip

Restrict on the amount of Chips and Chocolates as they are high in fats

Juices and Aerated drinks

If you look at the food label on the left, the Réal fruit juice 100 ml has 13.5 g of carbohydrate. If you drink a glass of Réal juice (200 ml), the carb content in your juice is 2 x 13.5 = 27 g.

Given are 15 g carb exchanges for aerated drinks

Helpful Tip

Juices and aerated drinks should be consumed only when blood glucose levels are low as they increase blood glucose levels rapidly.

CHAPTER 11

Eating Out

When you can't measure, estimate portions

You may have no problem counting carbohydrates in your morning bowl of oatmeal, egg sandwich or an apple; but walk into a restaurant and order the chicken manchurian with fried rice and you are left guessing as to how much carbohydrate you are eating. An essential part of carb counting is accurately estimating portion sizes.

When dining out at the homes of friends and family or at restaurants, do not hesitate to ask for information about the ingredients that have been used to prepare the dish, so that you can count your carbohydrates.

When at a restaurant, keep these simple tips in mind

- Try and eat portion similar to what you would eat at home
- Ask for salad dressing on the side
- Ask for smaller or half portions
- Skip appetizers, bread and butter
- Order extra veggies (eg. sauted spinach, grilled mushrooms) on the side
- Go for clear soups instead of the creamy ones
- Ask for less sauce to be added to your meals
- You may ask the chef to hold the cream, which is often put as a garnish over most soups. Avoid fried croutons in the soup
- You may ask the chef not to add any cream, tadka of ghee or butter before serving

Healthy options

- Roasted
- Steamed
- Grilled
- Broiled
- Poached
- Baked
- Lightly stir fried
- Red sauce (instead of white)
- Choose mustard over mayonnaise
- Plain lime and vinegar dressing
- Low fat yogurt

Carbohydrate content in Indian and International cuisines

The following pages show images of commonly eaten dishes of Indian and International cuisines eaten at restaurants. However the portions and method of preparation will change from restaurant to restaurant. This is just a guide for understanding carb portions of your favourite cuisines.

Important Note

Though some of the dishes are low in carb, they could be high in fat. Choose wisely! Order low carb, low fat options

Indian Cuisine

South Indian

▪ Idli Sambhar

Serving Amount	Carbohydrate
1 Idli (Restaurant 1 no.)	15 g
Sambhar (Restaurant 1 Soup Bowl)	30 g
Sambhar (Homemade 1 Soup Bowl)	10 g
Coconut Chutney (1 Small Bowl)	

▪ Medu Vada

Serving Amount	Carbohydrate
1 Vada (Restaurant 1 no.)	23 g
Sambhar (Restaurant 1 Soup Bowl)	30 g
Sambhar (Homemade 1 Soup Bowl)	10 g
Coconut Chutney (1 Small Bowl)	

▪ Sada Dosa

Serving Amount	Carbohydrate
1 Dosa (1 no.)	30 g
Sambhar (Restaurant 1 Soup Bowl)	30 g
Sambhar (Homemade 1 Soup Bowl)	10 g
Coconut Chutney (1 Small Bowl)	

▪ Masala Dosa

Serving Amount	Carbohydrate
1 Dosa (1 no.)	30 g
Potato bhaji (100 g)	15 g
Sambhar (Restaurant 1 Soup Bowl)	30 g
Sambhar (Homemade 1 Soup Bowl)	10 g
Coconut Chutney (1 Small Bowl)	

▪ Rawa Masala Dosa

Serving Amount	Carbohydrate
Dosa (1 no.)	30 g
Potato bhaji (100 g)	15 g
Sambhar (Restaurant 1 Soup Bowl)	30 g
Sambhar (Homemade 1 Soup Bowl)	10 g
Coconut Chutney (1 Small Bowl)	

▪ Appam

Serving Amount	Carbohydrate
1 Appam (65 g)	31 g

South Indian

Indian Cuisine

▪ Malabari Paratha

Serving Amount	Carbohydrate
1 Paratha (40 g)	31 g

▪ Tamarind Rice

Serving Amount	Carbohydrate
1 Soup Bowl	50 g

▪ Hyderabadi Biryani

Serving Amount	Carbohydrate
1 Soup Bowl	50 g

▪ Rasam

Serving Amount	Carbohydrate
With Jaggery 1 Soup Bowl	10 g
Without Jaggery 1 Soup Bowl	3 g

▪ Avial

Serving Amount	Carbohydrate
1 Soup Bowl	30 g

▪ Ishtew

Serving Amount	Carbohydrate
1 Soup Bowl	25 g

Indian Cuisine

South Indian

▪ Vazhakkaithoran

Serving Amount	Carbohydrate
1 Dessert Bowl	30 g

▪ Mirchkasalan

Serving Amount	Carbohydrate
1 Soup Bowl	10 g

▪ Chicken Chettinad

Serving Amount	Carbohydrate
100 g	5 g

▪ Pal Payasam

Serving Amount	Carbohydrate
1 Dessert Bowl	30 g

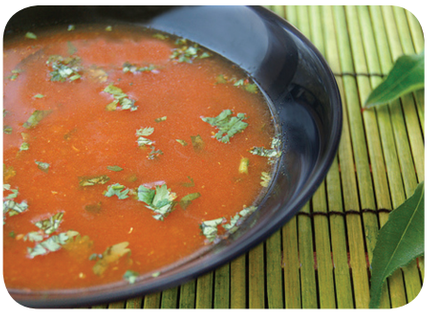
▪ Gillefirdaus

Serving Amount	Carbohydrate
1 Dessert Bowl	45 g

■ Aamti

Serving Amount	Carbohydrate
1 Dessert Bowl	10 g

■ Tomato Sar



Serving Amount	Carbohydrate
1 Soup Bowl	10 g

■ Masala Bhaat

Serving Amount	Carbohydrate
1 Soup Bowl	33 g

■ Prawn Pulav

Serving Amount	Carbohydrate
1 Soup Bowl	33 g

■ Kombdi Vade

Serving Amount	Carbohydrate
1 Dessert Bowl (thick gravy) + 2 vade (30 gm each)	45 g

■ Tamatara Ursev Ki Subzi

Serving Amount	Carbohydrate
1 Soup Bowl	8 g

Indian Cuisine

West Indian

▪ Gatte Ki Subzi

Serving Amount	Carbohydrate
1 Dessert Bowl	17 g

▪ Makkai Nu Shaak

Serving Amount	Carbohydrate
1 Soup Bowl	35 g

▪ Goan Fish Curry

Serving Amount	Carbohydrate
1 Soup Bowl	5 g

▪ Fish Caldeen

Serving Amount	Carbohydrate
1 Soup Bowl – 100g fish	7 g

▪ Laalmaas

Serving Amount	Carbohydrate
1 Soup Bowl	5 g

▪ Mutton Kolhapuri

Serving Amount	Carbohydrate
1 Soup Bowl	5 g

■ Pork Vindaloo

Serving Amount	Carbohydrate
1 Soup Bowl (Pork 150 g)	5 g

■ Sukhe Mutton

Serving Amount	Carbohydrate
1 Soup Bowl (150 g mutton)	8 g

■ Safedmaas

Serving Amount	Carbohydrate
1 Soup Bowl (200 g meat)	8 g

■ Bharwanmirch

Serving Amount	Carbohydrate
2 Bhaavnagiri Mirch	13 g

Indian Cuisine

North Indian

■ Kulcha

Serving Amount	Carbohydrate
1 Kulcha	33 g

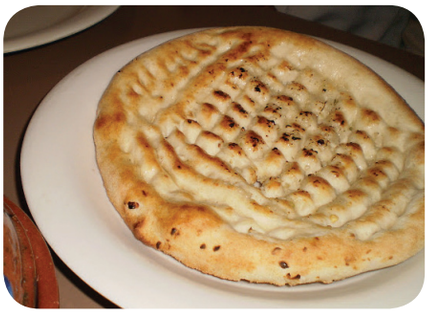
■ Plain Paratha

Serving Amount	Carbohydrate
1 Paratha	22 g

■ Tandoori Roti

Serving Amount	Carbohydrate
1 Roti	33 g

■ Naan



Serving Amount	Carbohydrate
1 Naan	47 g

■ Cholebhature

Serving Amount	Carbohydrate
Chole 1 Soup Bowl	17 g
Bhature - 1 Bhature	22 g
Total	**39 g**

■ Makki Ki Roti

Serving Amount	Carbohydrate
1 Roti	20 g

■ Sarso Da saag

Serving Amount	Carbohydrate
1 Soup Bowl	5 g

■ Dal Makhni

Serving Amount	Carbohydrate
1 Soup Bowl	30 g

■ Dum Aloo

Serving Amount	Carbohydrate
1 Soup Bowl	18 g

■ Bainganbharta

Serving Amount	Carbohydrate
1 Soup Bowl	6 g

■ Dum Bhindi

Serving Amount	Carbohydrate
1 Soup Bowl	6 g

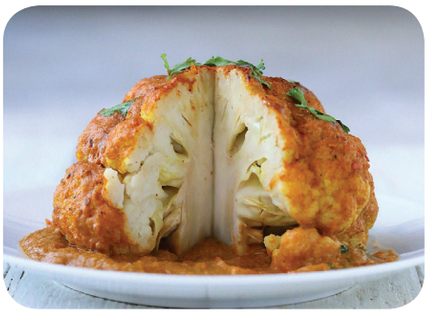
■ Tinda Masala

Serving Amount	Carbohydrate
1 Soup Bowl	6 g

Indian Cuisine

North Indian

■ Gobhimusallam



Serving Amount	Carbohydrate
1 Soup Bowl	5 g

■ Shammi Kebab

Serving Amount	Carbohydrate
1 no.	5 g

■ Reshmi Kebab

Serving Amount	Carbohydrate
1 no.	5 g

■ Kakori Kebab

Serving Amount	Carbohydrate
2 no.	5 g

■ Chicken Tandoori

Serving Amount	Carbohydrate
150 g	3 g

■ Rogan Josh

Serving Amount	Carbohydrate
1 Soup Bowl	3 g

■ Chicken Makhanwala (Butter Chicken)

Serving Amount	Carbohydrate
1 Soup Bowl	5 g

■ Acharigosht

Serving Amount	Carbohydrate
1 Soup Bowl	6 g

■ Jalebi

Serving Amount	Carbohydrate
1 Jalebi	18 g

■ Kulfi

Serving Amount	Carbohydrate
1 no.	25 g

■ Sooji Halwa

Serving Amount	Carbohydrate
1 Dessert Bowl	45 g

Indian Cuisine

East Indian

▪ Momos

Serving Amount	Carbohydrate
1 Momo	11 g

▪ Jhalmuri

Serving Amount	Carbohydrate
1 Soup Bowl	15 g

▪ Thukpa

Serving Amount	Carbohydrate
1 Soup Bowl	25 g

▪ Luchi

Serving Amount	Carbohydrate
2 Luchi	22 g

▪ Ghee Bhaat

Serving Amount	Carbohydrate
1 Soup Bowl	40 g

▪ Cholar Dal

Serving Amount	Carbohydrate
1 Dessert Bowl	18 g

■ Lau Chingri

Serving Amount	
1 Soup Bowl	5 g

■ Doi Mach

Serving Amount	Carbohydrate
1 Soup Bowl	5 g

■ Macherjhol

Serving Amount	Carbohydrate
1 Soup Bowl	5 g

■ Sandesh

Serving Amount	Carbohydrate
1 pc.	16 g

■ Patishapta

Serving Amount	Carbohydrate
1 pc.	35 g

■ Rosogullah

Serving Amount	Carbohydrate
1 pc.	15 g

Indian Cuisine

East Indian

▪ Chum Chum

Serving Amount	
1 pc.	30 g

▪ Malpua

Serving Amount	Carbohydrate
1 pc.	23 g

▪ Mistidoi

Serving Amount	Carbohydrate
1 cup	27 g

▪ Balushahi

Serving Amount	Carbohydrate
1 pc..	30 g

■ Tom Yum Gong

Serving Amount	Carbohydrate
1 Soup Bowl	4 g

■ "Som Tam" Spicy Papaya Salad'

Serving Amount	Carbohydrate
1 Soup Bowl	20 g

■ Galoumbihartao-hou

Serving Amount	Carbohydrate
4 no.	36 g

■ Tung Tong

Serving Amount	Carbohydrate
1 no.	4 g

■ Krathak Fire Cracker

Serving Amount	Carbohydrate
3 pc.	10 g

■ Gai Med Ma Moung (Chicken Cashew nuts)

Serving Amount	Carbohydrate
100 g (with cashew nuts)	15 g

■ Stuffed Chicken Breast

Serving Amount	Carbohydrate
1 pc	5 g

■ Geng Kheaw Wan Gai (Green Curry Chicken)

Serving Amount	Carbohydrate
1 Soup Bowl (100 g Chicken)	5 g

■ Steam Rice

Serving Amount	Carbohydrate
1 Soup Bowl	40 g

■ Kao Phad Fried Rice

Serving Amount	Carbohydrate
1 Soup Bowl	50 g

■ Pad Thai

Serving Amount	Carbohydrate
1 Soup Bowl	40 g

■ Minestrone Soup

Serving Amount	Carbohydrate
1 Soup Bowl	11 g

■ Pasta e Fagioli (Pasta and Beans Soup)

Serving Amount	Carbohydrate
1 Soup Bowl	25 g

■ Risotto

Serving Amount	Carbohydrate
1 Soup Bowl	52 g

■ Caponata

Serving Amount	Carbohydrate
1 Soup Bowl	15 g

■ Spaghetti with Meat Balls

Serving Amount	Carbohydrate
1 Soup Bowl	35 g

■ Pasta with Arabiatta Sauce

Serving Amount	Carbohydrate
1 Soup Bowl	25 g

International Cuisine

Italian

- **Pasta with White Sauce**

Serving Amount	Carbohydrate
1 Soup Bowl	30 g

- **Lasagna**

Serving Amount	Carbohydrate
1 Large Square	40 g

- **12" Plain Medium Thin Crust Pizza, no extra toppings**

Serving Amount	Carbohydrate
1 Slice (1/8th of Pizza: 55 g)	16 g

- **Tiramisu**

Serving Amount	Carbohydrate
1 pc.	22 g

■ Mexican Corn Soup

Serving Amount	Carbohydrate
1 Soup Bowl	15 g

■ Chimichangas

Serving Amount	Carbohydrate
1 no.	27 g

■ Chilli Con Carne

Serving Amount	Carbohydrate
1 Soup Bowl	25 g

■ Pimento rice

Serving Amount	Carbohydrate
1 Soup Bowl	54 g

■ Burrito

Serving Amount	Carbohydrate
1 no.	45 g

■ Quesadilla

Serving Amount	Carbohydrate
1 no.	21 g

International Cuisine

Mexican

▪ Enchilada

Serving Amount	Carbohydrate
1 no.	45 g

▪ Tacos

Serving Amount	Carbohydrate
2 no.	55 g

▪ Nachos

Serving Amount	Carbohydrate
14 Chips (28 g)	19 g

▪ Fajitas

Serving Amount	Carbohydrate
1 no.	31 g

Chinese

International Cuisine

■ Hot and Sour Soup

Serving Amount	Carbohydrate
1 Soup Bowl	10 g

■ Wonton Soup

Serving Amount	Carbohydrate
1 Soup Bowl (4 wontons)	15 g

■ Manchow Soup (without noodles)

Serving Amount	Carbohydrate
1 Soup Bowl	10 g

■ Spring Rolls

Serving Amount	Carbohydrate
1 pc.	10 g

■ Sichuan Beans

Serving Amount	Carbohydrate
1 Soup Bowl	5 g

■ Stir Fried Chicken and Peppers

Serving Amount	Carbohydrate
1 Quarter Plate	5 g

International Cuisine

Chinese

■ Chinese Fried Rice

Serving Amount	Carbohydrate
1 Soup Bowl	47 g

■ Chowmein

Serving Amount	Carbohydrate
1 Soup Bowl	55 g

■ Hakka Noodles

Serving Amount	Carbohydrate
1 Soup Bowl	55 g

Fast Food

Please refer to the following websites for the fast foods. Keep a watch on portion size and the dressings used. Opt for low calorie dressings like mustard, lemon and vinegarette wherever possible. Nutritional values are available on the websites of food chains mentioned below.

1. Mc Donalds

www.mcdonaldsindia.com

Go for smaller portions without mayonnaise

Below mentioned are the values for some of the commonly eaten items at Mc Donalds

Item	Amount	Carb (g)
Mc Chicken	1 no (173 g)	49
Mc Veggie	1 no (169 g)	56
Mc Aloo Tikki	1 no (145 g)	50
Chicken Mc Grill	1 no (130 g)	33
Fries	Regular	110
	Medium	156
	Large	220

2. Subway

www.subway.co.in

Choose subs without cheese and mayonnaise and generous helping of vegetables

Healthy options

- Veggie delite sub and salad
- Roasted chicken breast sub & salad
- Turkey breast sub & salad
- Southwest chicken

3. KFC

www.kfc.com

Refrain from crispy options

Healthy options

- Grilled chicken

4. Pizza

Choose Thin crust pizzas with less cheese and more vegetable toppings

Healthy options

- Thin crust pizza
- Garlic bread (without cheese)
- Mexican salsa wrap

4a. Pizza Hut

www.pizzahut.com

4b. Dominos Pizza

www.dominos.co.in

5. Ice Creams (Baskin Robbins)

www.baskinrobbins.com

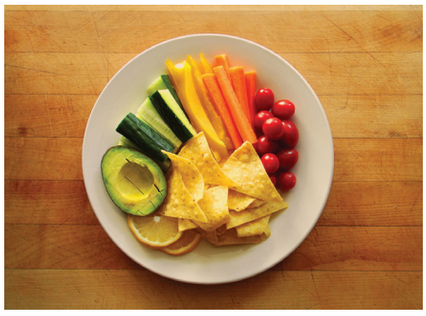
6. Burger King

www.mobile.bk.com

Snacks

Though healthy, they need to be consumed in moderation

Fast Food



Healthy Snacking Options

- Salads / Carrot Cucumber Sticks (only mustard / vinageratte / lemon dressing / No croutons)
- Grilled / Sauted Vegetables
- Sauted Mushrooms
- Clear soups (No noodles / Croutons)
- Plain Popcorn
- Boiled Eggs
- Tandoori Chicken
- Grilled / Steamed Fish
- Kababs
- Plain tea, green tea or coffee without milk or sugar.
- Salted Lemon Water
- Tomato juice
- Thin Buttermilk
- Rasam
- Moong Jor / Chana Jor
- Koormura Chana
- Scrambled / Grilled Tofu / Low fat Paneer
- Sprouted Moong
- Moong / Sprout Dosa
- Soy Milk (plain / unsweetened)
- Besan Chilla / Moong Dal Chilla / Pudla
- Steamed Patra / Aluwadi
- Khandvi
- Steamed Momos
- Rice wrap Steamed Veg / Chicken Spring rolls
- Low Fat Yogurt
- Moong Noodles with Veggies and Egg / Mushroom / Shredded Chicken
- Makhana & Jowar puffs

Quiz Time 6

Q1. **Calculate the Carbohydrate Content for this homemade meal.**

Q2. **Which has more carbohydrates, Rasam or Dal?**

Q3. **Fill in the carbohydrate content of the following meals**

a. 2 Small Moong Dal Chillas
Curd 100 g
1 Pear

b. 1 cup poha
1 cup Milk (cow, 150 ml)
1 Apple (medium)

c. 1/2 cup Chinese fried rice
1 Bowl Manchow Soup
2 Spring Rolls

Q4. **Complete the following chart to test your understanding:**

a. 2 slices whole wheat bread = _____ g of carbohydrates

b. 1 whole elaichi banana = _____ g of carbohydrates

c. 1/3rd cup oats with 150 ml of buffalo milk = _____ g of carbohydrates

Continued on next page (Answers on Page 76

Q5. **Plan two breakfast meals containing 45gms of carbohydrate.**

Q6. **Calculate the carbohydrate content for this meal.**

Q7. **Test your memory.**

How much of each of these foods can you have for a 15 gram carbohydrates serving?

a. Sweetlime _____
b. Dates _____
c. Popcorn _____
d. Rice _____
e. Marie biscuits _____
f. Usal _____

Q8. **Which will have the greater effect on blood glucose?**

1 tsp sugar or ½ cup mashed potatoes (no butter)

Q9. **Calculate the available carbohydrate for this breakfast meal.**

Breakfast Meal	Carbohydrate (g)	Fiber (g)	Available Carbohydrate (g)
½ grapefruit	15	1.7	
½ cup bran cereal	22	10.0	
1 slice whole - wheat bread	12	1.5	
Total	**49**	**13.2**	

Answers on Page 76

CHAPTER 12

Insulin Pump Therapy

Insulin pump therapy is a boon to people with diabetes today as you can match your insulin to your lifestyle, rather than getting an insulin injection and matching your life to how the insulin is working. People of all ages with type 1 diabetes use insulin pumps and people with type 2 diabetes have started to use them as well.

Insulin pumps mimic the healthy human pancreas by delivering bolus (just before meals) and basal (in between meals and night) insulin, hence improving blood glucose control.

- **Basal dose:**
  - The insulin pump delivers a low level of continuous insulin at a set rate throughout the day to keep your blood glucose levels in range between meals and overnight
  - Take help from your doctor and diabetes educator to set the right basal dose for you
- **Bolus dose:**
  - The insulin pump delivers insulin just before meals which helps in controlling your post- meal blood glucose levels. This is called Food Bolus
  - It is also used to 'correct' an out of range blood glucose-correction bolus

Hitting the Bull's Eye- Know your targets:

For most people with diabetes, the American Diabetes Association 2018 recommends the following blood glucose targets

- Fasting blood glucose with diabetes should be in the range of 80 – 130 mg/dl (4.4-7.2 mmol/l)
- Post meal to be less than 180 mg/dl (10.0 mmol/l)
- A1c <7% (with no episodes of hypoglycemia)
- Less stringent A1c goals of <8% may be appropriate for patients with history of severe hypoglycemia, extensive co-morbidities etc.

Your target ranges may differ depending upon your age, in pregnancy, complications and other factors. Speak to your doctor/diabetes educator to know your blood glucose targets.

Regular **blood glucose monitoring** is the key to giving you the information you need to effectively manage your diabetes .Without regular testing, you won't know how well your diet, exercise, or medication are working. Testing blood glucose 4-6 times a day tells you if you are on the right track or if you need to make changes.

Insulin to Carbohydrate ratio (I:C factor)

As you are aware, eating foods rich in carbohydrate causes your blood glucose to rise. Insulin helps move the glucose from the blood into the cells where it can be used for energy. Using insulin-to-carbohydrate ratio is an advanced method of carbohydrate counting. This method matches your insulin dose to the amount of carbohydrates you eat. This can help you keep your blood glucose levels within your goal range.

Your healthcare team will help you determine your insulin to carb ratio.

Example of how to determine an insulin dose using an Insulin-to-Carb Ratio and Blood glucose correction factor

Insulin to Carbohydrate Ratio (I: Cfactor):

The number of carbohydrate grams covered by one unit of insulin.

1 unit of insulin covers _____ grams of carbohydrate

Correction Dose: The amount of insulin added to or subtracted from a bolus to correct blood glucose that is above or below target.

Target blood glucose (Target B.G): The Blood glucose value that is targeted when determining the need for a correction dose. The target may change for pre-meal, post-meal or bedtime.

When your blood glucose goes unexpectedly high, a correction bolus can be used to bring it down. To use the right correction bolus, we need to first identify the insulin-sensitivity factor.

Insulin Sensitivity Factor (ISF): It is the dose of insulin required to bring down a high blood glucose level to the desired target range.

1 unit of rapid- or short-acting insulin for every ____ points (mg/dL) blood glucose level is over target of ____ mg/dL

You figure the dose in a 2-step process

Step 1: Calculate the total daily dose

Total Daily Dose (TDD) is the amount of insulin delivered by the insulin pump each day.

Pump TDD = Basal insulin + Bolus insulin (units/day)

For eg: Basal dose= 20 and Bolus dose= 20,

Total Daily dose (TDD)= 40

Step 2: Calculate Insulin to Carb Ratio (ICR)

Determine the amount of carbohydrates (grams) covered by one unit of insulin

* 500 Rule

500 ÷ by the Pump TDD = ICR

For Eg: 500 ÷ 40 = 12.5 grams (TDD= 40)

1 unit covers ~ 12.5 grams of carbohydrate

For regular/short acting insulin the rule of 450 applies

**For very young children who need less than 10 units of insulin a day, 500 rule may not be applicable. These cases sometimes need more doses of insulin in which case, the 300–450 rule may be adaptable. In practice, the detailed records of self-monitored blood glucose (SMBG results), carb intake and insulin doses provide useful information for making ratio adjustments.*

Check your blood glucose levels before and after meals. If your glucose levels two hours after meals (unless your doctor advises you otherwise) are in the target range , it means that your insulin to carb ratio is working fine.

For Example (Breakfast):

2 Toast: 30 g
Egg: 0 g
1 cup Milk: 7.5 g
1 Apple: 15 g

Total Carbs: 52.5 g

Insulin to Carb Ratio 1:12.5

Amount of insulin required for this meal: 4.2 U

Delivery options for meal bolus

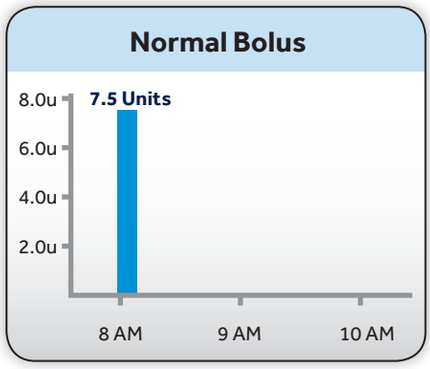
Insulin pump therapy offers flexibility by allowing meals and snacks to be customized to fit your schedule and preferences in timing, size of meals and type of food.

The Medtronic Minimed pump offers three unique meal bolus delivery options: **Normal, Square Wave and Dual Wave.**

By means of a continuous glucose monitoring system (CGMS), we now have the option to monitor post meal blood glucose excursions much more closely than was possible in the past with just finger tip blood glucose monitoring. This will help understand the impact of all meal-related factors on post meal blood glucose and ways to achieve good blood glucose control.

i) Normal bolus

A Normal bolus delivers a specific dose of insulin over a short period of time. It acts similar to your insulin injection.



Where to use Normal Bolus?

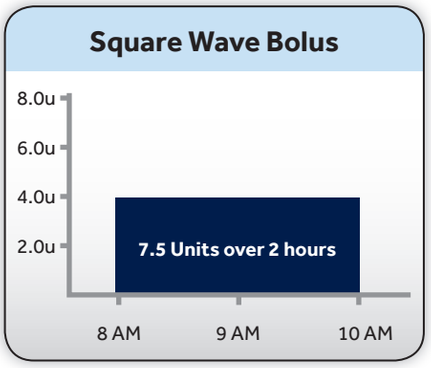
This bolus type is the most commonly used option for everyday meals and snacks containing high carb, average protein and fat content. It covers the carbohydrates in your meal and returns blood glucose to normal levels quickly.

It is also used to deliver correction boluses to lower your blood glucose.

Meal Examples:

- **High glycemic index foods**
- **Pasta, white rice, bread, biscuits, fruits, fruit juice / root veg (potato, yam, arbi)**

ii) Square wave bolus



A square wave bolus delivers insulin evenly over a specified period of time that you set. The time set can range from 30 minutes to 8 hours.

Where to use a square wave bolus ?

High protein (more than 40% protein), minimal carb meals or high fiber meals.

Foods high in protein, fat or fiber may take a few hours to digest, thereby delaying absorption of the carbohydrates raising blood glucose for upto many hours after the meal is eaten.

Multi course meal where absorption is delayed due to grazing such as receptions, get togethers.

In Coeliac disease or medical conditions caused due to diabetes like gastroparesis where there is delayed digestion and absorption due to which glucose levels run high for upto some hours after the meal.

Meal Examples:

- **Low Glycemic Index foods,**
- **Big steak with grilled vegetables Tandoori Chicken with salad, Oatmeal, Muesli, Cake, Desserts like ice-cream, custard, shrikand, gulab jamun, rasgulla.**

For example: 8 Units Bolus

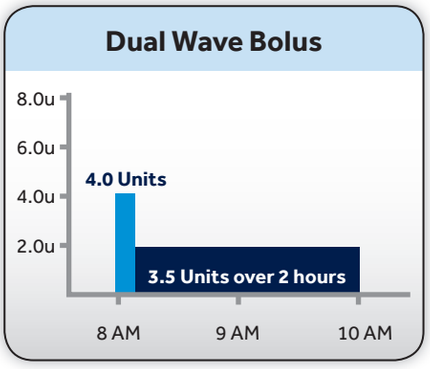
Buffet - square over 4 hrs

8/4= 2 Units /hr

iii) Dual wave bolus

Dual Wave bolus is the combination of a Normal Bolus and a Square Wave Bolus.

In this kind of bolus setting, part of the bolus is delivered as soon as **ACT is pressed (Normal) and the remainder delivers evenly over the period of time you set (Square Wave).**



Where to use a dual wave bolus?

The dual wave bolus is primarily used for mixed meals and foods high in carbohydrate and fat. Carbohydrates are absorbed quickly whereas fat takes longer to absorb, which delays digestion (for example: pizza, Indian, Chinese or Mexican meals).

For example, you may start your dinner with fruit salad, but then eat a few slices of pizza, which can cause your blood glucose levels to rise much later.

Meal Examples:

- **Mixture of low glycemic and high glycemic foods**
- **Coke / Fruit+ Cheese sandwich**
- **Chinese / Mexican meals**
- **Indian Meal - Chapati + Dal + Yogurt + vegetable**
- **Fruit salad / Coke + pizza**
- **Biryani + Raita**

For example: 8 Units Bolus

1. High protein with carbohydrate (50g protein, 15g fat and 30g carbohydrates)
   Eg. Chicken or Paneer tikki + Coke – 60:40 square over two hours
   8/2 = 4.8 U Normal bolus + 3.2 U square over two hours
2. High protein, high fat with carbohydrate (50g protein, 30g fat and 30g carbohydrate)
   Eg. Chicken cheese burger or Paneer Cheese burger - 60:40 square over three hours
   8/3 = 4.8 U Normal bolus + 3.2 U square over three hours

- The fraction of bolus you set to deliver now (normal bolus) and as a square wave bolus will vary based on the carb, protein and fat content of the meal
- When using the Dual wave bolus with meals that are relatively moderate in their protein and fat content, many Medtronic Minimed pump users experience an improved food to insulin match by taking **60% of the bolus dose as normal and 40 % of the bolus dose as square delivered over 2 hours**
- Traditional Indian thali - Chapati, rice, dal and vegetable - 60 % Normal bolus and square the remaining 40% over 1 to 2 hrs
- Meal-Pizza, tiramisu, and regular Coke (11% protein, 53% carbohydrate, 36% fat) 70% as normal bolus and 30% squared over 2 hours *
- Protein rich meal-Grilled chicken with a small portion of mash potato or a Sizzler with a big portion of steak - 20% Normal bolus and 80% squared over 2 to 3 hours *

Important Note

As the fat and protein content of the meal starts increasing, we should consider extending the "time" factor of the "square" part of the bolus as the fat and protein delay the absorption of glucose. The amount of carbohydrate in the meal would influence the ratio of Normal to Square wave bolus.

These are only examples. Your healthcare team and your doctor are the best judge. Please consult them to know which bolus type and amount would work best for your unique needs.

**Ref No 17, 18, 35*

Bolus Wizard

- **Bolus Wizard** is a useful feature available in Medtronic Minimed Paradigm. Insulin pumps which helps you estimate the food bolus and correction bolus based on your blood glucose levels, carbohydrate intake and other parameters that are programmed in the pump. You need to set the wizard on in order to get maximum benefit out of your insulin pump

Example Setting

Wizard: On

Carb Units: Grams

Carb Ratios: 12

Sensitivity: 42

BG Target: 100-110

Active Insulin Time: 5 hours

Example of Dose Calculation

Estimate Details

Estimate total: **3.0 units**

Food Intake : 24 grams

BG : **220 mg/dL**

Food : **2.0 units**

Correction : **2.6 units**

Active Insulin : **1.6 units**

24 grams
÷ 12 *(carb ratio)*
2.0 units *(food bolus)*

$$\frac{220\text{-}110\ (\textit{target BG})}{42\ \text{mg/dL}\ (\textit{sensitivity factor})} = \frac{110}{42} = 2.6\ \text{units}$$

2.6 units *(correction)*
- 1.6 units *(active)*
= 1.0 unit *(suggested correction)*

2.0 units *(food bolus)*
+ 1.0 unit *(suggested correction)*
3.0 units *(estimated bolus)*

- The Bolus Wizard calculator lets you set different blood glucose targets throughout the day. These unique personalisations helps ensure that bolus estimates are more closely matched to your needs, which can help you achieve even better blood glucose control

- Get help from the Medtronic representative to set the Bolus Wizard

  Once the Bolus Wizard is programmed, all you need to do is enter your current blood glucose and the number of grams of carbohydrate that you plan to consume.

  The Bolus Wizard calculator will do the math and provide a suggested insulin dose based on your blood glucose, carbohydrate intake and other pre-set parameters.

You simply enter two data

- **Your current Blood glucose value**
- **The amount of carbohydrates you are eating**
- **To get your blood glucose levels back to the target range after meals, the bolus dose must match the food you eat**

EXAMPLE 1

1. Meal / Food Bolus

Eg: Breakfast 2 restaurant idlis, 1 soup bowl sambar and chutney
30 + 30 = 60g carbs ICR (Insulin to carb ratio) 1:10

60/10 = 6U

2. Correction Bolus

Current BG ..... 240 mg/dl
Target BG ..... 100 mg/dl
ISF (Insulin Sensitivity Factor) 1:70

240 -100/70 = 2U

3. Bolus Wizard Estimated Bolus

One of the most common bolusing errors is to over-correct for a post-meal rise in your blood glucose. Over-correction may occur when the amount of insulin still active in your body is not properly taken into consideration.

6U + 2U = 8U

When your blood glucose is above target, the Bolus Wizard calculator automatically takes into account the amount of active insulin still in your body. This is designed to help you avoid hypoglycaemia, or low blood glucose, resulting from too much insulin.

EXAMPLE 2

1. Meal / Food Bolus 0 g
ICR (insulin to cab ratio) 1:10

0/10= 0U

2. Correction Bolus

Current BG 240 mg/dl
Target BG 100 mg/dl
ISF (Insulin Sensitivity Factor) 1:70
Active Insulin from previous correction Bolus 1 U

240-100/70=2U

3. Bolus Wizard Estimated Bolus

N.B: The Bolus wizard calculator takes into account active insulin when estimating a correction bolus in response to an elevated blood glucose but does not consider active insulin when calculating the meal/food bolus.

2-1= 1U

Quiz Time 7

Q1. Your insulin to carb ratio is 1: 10. How much insulin would you need for the following meals?

a. An apple and ladoo

b. Rawa Masala Dosa (1no)
Restaurant sambar (1 soup bowl)
Tea (no sugar, 50 ml buffalo milk)
Apple (1 no, medium size)

Q2. Arushi's Insulin to Carb ratio is 1: 25. She is eating 100 gms of carbohydrate.

Arushi would need .....U of Insulin

Q3. Kashish's blood glucose levels are 75 mg/dl. She is having a cup of milk. How much bolus must she take?

Kashish must take ..... amount of bolus

Q4. 1 unit of insulin covers 20 gms of carbs. How much insulin would I need for the following meals?

a. 75g

b. 100g

c. 60g

d. 10g

Answers on Page 76

☑ Answer Keys

Quiz Time 1

1. Glucose
2. Hormone
3. No or little

Quiz Time 2

1. a, d, h, i, j
2. 9.2 g and 18-20 g
3. a. False | b. False | c. True
4. a. Carbohydrates: Fruits, Cereals, Corn
   b. Protein: Fish / Dal, Milk, Paneer
   c. Fat: Butter, Oil, Ghee
5. Simple Carb (a, c & f) | Complex Carb (b, d & e)

Quiz Time 3

a. False

b. False

c. True

Quiz Time 4

1. 1 serving has 37 g , 100 g has 79 g, 200 g has 158 g
2. 100 g has 49 g, 40 g has 20 g
3. Maltitol which is a sugar alcohol
4. 50 – 7 = 43 g
5. 20, 5

Quiz Time 5

1. Portion
2. a. 240 ml milk
   b. Corn
   c. Meat
   d. Butter

☑ Answer Keys

Quiz Time 6

Q1. 15g for 2 homemade idlis, 10g for homemade sambar; Total – 25g

Q2. Dal as it has more quantity of pulse compared to rasam

Q3. a. 2 moong dal chillas-15g, Curds 100g - 4g, 1pear-15g; Total = 34g

b. 1 cup poha – 30g, 1 cup milk (cow, 150ml) - 7g, 1 apple (medium) - 15g; Total = 52g

c. ½ cup Chinese fried rice – 23g, 1 bowl of manchow soup – 10g, 2 spring roll – 20g; Total = 53g

Q4. a. 30g

b. 1 whole elaichi banana = 15g of carbohydrate

c. 1/3rd cup oats (15g) + 150ml of buffalo milk(12g) = 27g

Q5. Egg + 3 toast + 1 apple or 2 homemade idlis + 1 ½ soup bowl homemade sambar + 1 apple

Q6. Dosa 1 no. – 30 g, aloo bhaji ½ cup – 15 g, Sambar (restaurant – 1 soup bowl) - 30 g

Q7. a. Sweetlime – 2 nos.

b. Dates – 2 nos.

c. Popcorn – 24g

d. Rice – 1/3rd cup

e. Marie – 4 no.

f. Usal ½ cup

Q8. Mashed potato. The potatoes will contribute about 15 grams of carbohydrates, while a level teaspoon of sugar will only give 5 grams of carbohydrates. Therefore, the potatoes will have about three times the effect on blood sugar as compared to the table sugar

Q9. Bran cereal has 22g carbs and 10g fiber

22-10= 12g; Net Carbs= 39g

Quiz Time 7

Q1. a) 15/10=1.5 U, 30/10=3 U

b) 90 g/10 = 9 U

a. Rava masala dosa 1 no.– 30g

b. Restaurant sambar 1 soup bowl – 30g

c. Potato bhaji ½ cup– 15g

d. Tea (no sugar, 50ml buffalo milk)- 4.2g

e. Apple (1 medium) – 15g

Q2. 100/25= 4U

Q3. None

Q4. a. 3.75 U b. 5 U c. 3 U d. 0.5 U

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