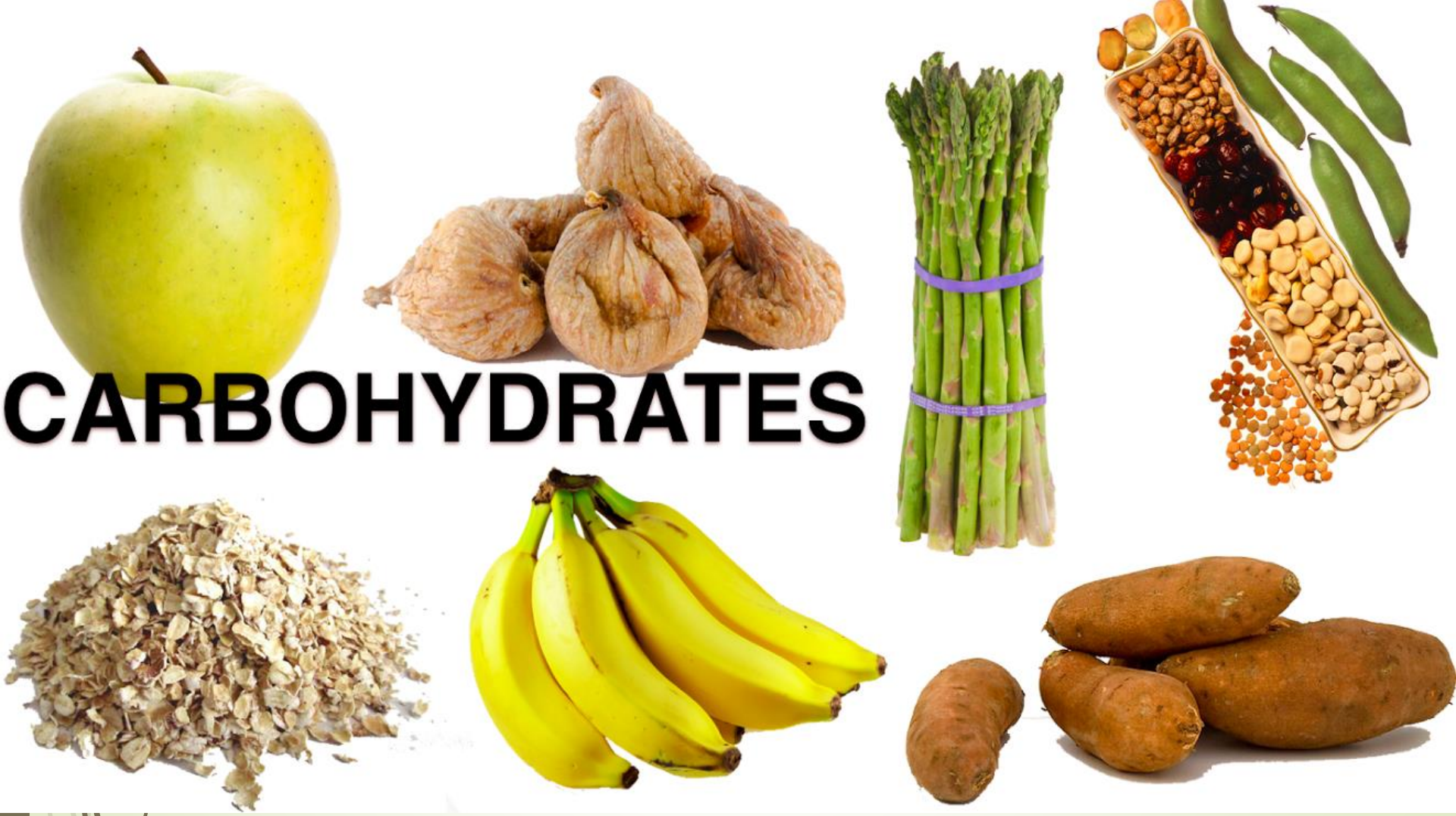


Prof Dr Najlaa Fawzi

L-2

All carbohydrates are organic compounds of carbon, hydrogen, and oxygen in the form of simple carbohydrates or sugar. When linked together, these simple sugars form three sizes of CHO: monosaccharide, disaccharide, & polysaccharide.

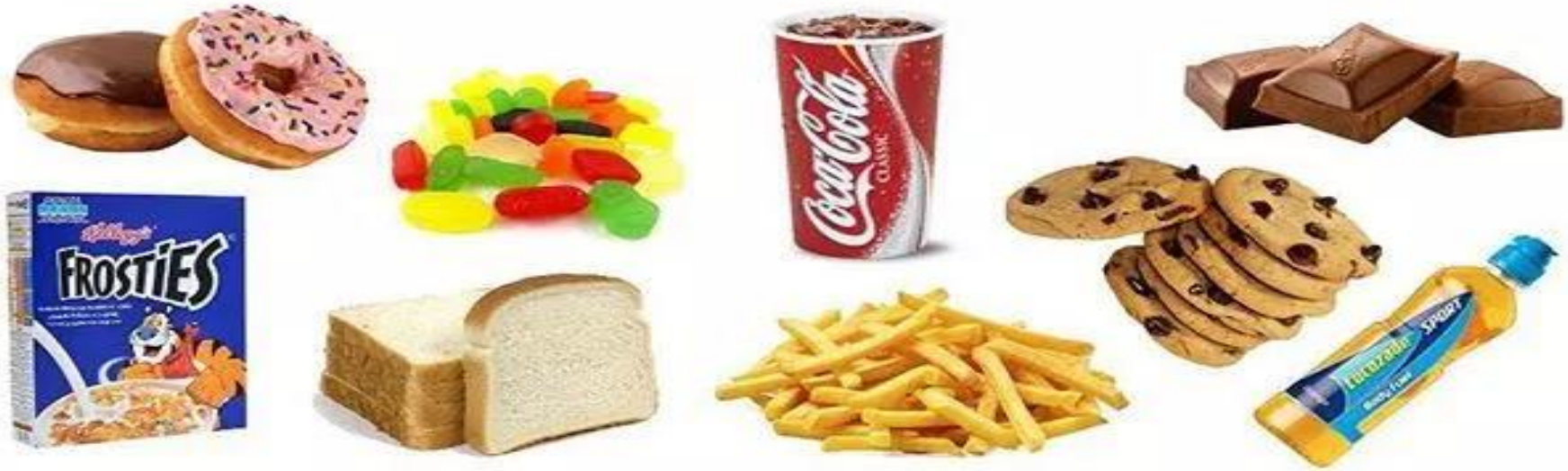
The three sizes of CHO are divided into two classifications: simple carbohydrates (Monosaccharide & disaccharides) and complex carbohydrates (polysaccharides).

Both are valuable sources of CHO energy.

There are differences between the health values of simple & complex CHO found in foods we consume, as complex CHO may also provide fiber in addition to glucose.

✔ COMPLEX CARBS

✘ SIMPLE CARBS



Starch is the storage form of glucose found in plants. whereas glycogen is storage form in the liver & muscle.

The **simple sugar's** are found in confectionery, muesli bars, cakes and biscuits, cereals, puddings, soft drinks and juices and jam and honey but they also contain fat.

Starchy carbohydrates are found in potatoes, rice, bread, wholegrain cereals, semi skimmed milk, yoghurt, fruit, vegetables, beans and pulses.

The **starchy carbohydrates** are the ones that have all the vitamins and minerals in them as well as protein.

They are also low in fat.

Both types effectively replace muscle glycogen.

The starchy foods are much more bulky so there can be a problem in actually eating that amount of food so supplementing with simple sugar alternatives is necessary.

Our digestive system converts the carbohydrates in food into Glucose.

Any glucose not used by the cells is converted into glycogen - another form of carbohydrate that is stored in the muscles and liver.

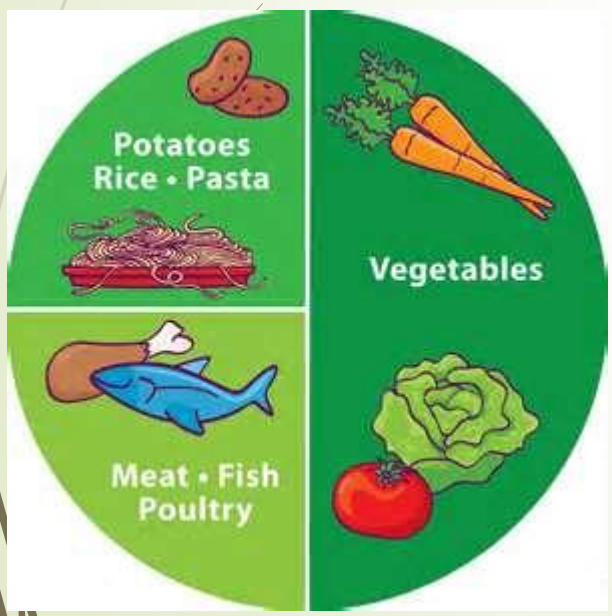
However, the body's glycogen capacity is limited to about 350 grams; once this maximum has been reached, any excess glucose is quickly converted into fat.

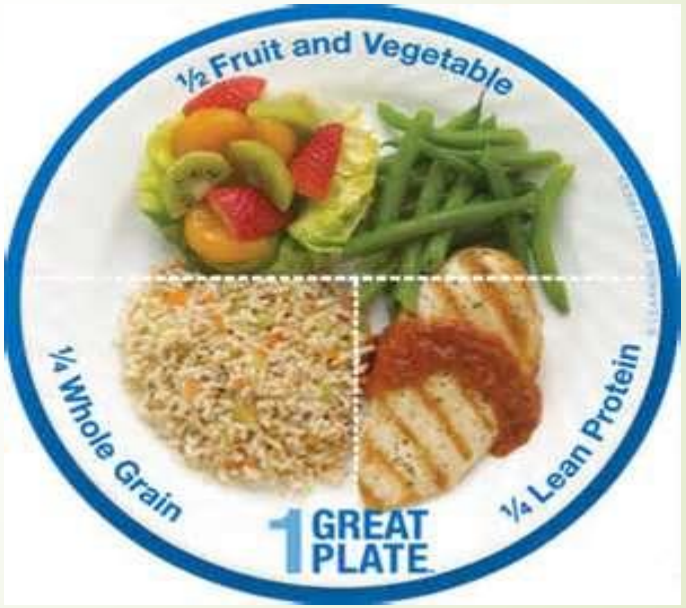
Glycogen stores will last for approximately 10 to 12 hours when at rest (sleeping) so this is why breakfast is essential.

Eating 5-6 meals or snacks a day, will help maximize glycogen stores and energy levels, minimize fat storage and stabilize blood glucose and insulin levels.

Base the main meal with the bulk on plate filled with carbohydrates and small amounts of protein such as meat, poultry and fish.

The extra protein & vitamins may require will be in the starchy carbohydrates.





Carbohydrates – what is a portion?

– what is a portion?
-1 medium slice of bread
-Pasta (boiled) 2-3 tablespoons
-Rice (boiled) 2-3 tablespoons
-2 egg sized new potatoes (boiled)
-1 medium baked potato (with skin)*
-Breakfast cereal: 3 tablespoons

In general CHO are the most important source of energy in the diet, approximately 50% of the total calories of American diet are CHO, and this may reach up to 80% in many developing countries.

There are practical reasons for such large quantities of CHO in diet all over the world:

1- CHO are widely available, because are easily grown in such plants as grains, vegetables, & fruits.

2- CHO are relatively low in cost.

3- CHO foods can be kept in dry storage for relatively long periods without spoilage.

Why is carbohydrate essential nutrient?

CHO is essential primarily because of high energy requirements of central nervous system tissues [brain] .

The brain has limited ability to use non-carbohydrate energy sources.

In human, the brain requires an estimated (100 grams) of glucose per day which is one third to one half of CHO present in the average diet.

Other tissues, such as hematopoietic tissues & white blood cells are also obligate glucose users

The carbohydrates fuel factor is [4], it should provide approximately [50- 60%] of the total calories of a healthy person's well balanced diet.

Increased levels of complex carbohydrates appear to reduce risk factors of chronic diet- related disorders such as heart disease, diabetes, and some cancers.

It is recommends that we consume at least 55% of our total caloric intake [about 300 to 375 grams a day] as primarily complex CHO.

The five to six servings of fruits & vegetables and six to eleven servings of bread, cereal, rice, and pasta provide adequate amounts of complex CHO.

The minimum daily requirement of CHO is [100 grams] {400 Cal}, this equivalent to 2 liters of 5% dextrose in water.

If this minimum requirement is not covered, the result will be the extensive breakdown of body protein, as well as significant salt and water loss.

A diet low in carbohydrates may also lead to bone mineral loss, hyper cholesterolaemia, and mainly in keto genesis and ketone-body production in the mitochondria of liver cells.

Ketogenesis is the natural response of the body to a low-carbohydrate diet, owing to the exhaustion of cellular carbohydrate stores, such as glycogen and energy production through fatty acids.

For this reason, professional associations such as the British and the American Dietetic Association do not recommend low-carbohydrate diets, which usually are especially high in fat and protein.

Low-carbohydrate diets restrict caloric intake by reducing the consumption of carbohydrates to 20–60 g per day (typically less than 20% of the recommended daily caloric intake).

The maximum daily amount of glucose tolerated by an average person is about 400 g.

Health Effects:

The health concerns regarding sugar consumption include nutrient displacement, dental caries, and related issues of obesity and diabetes.

Displacement occurs when whole foods, which are minimally processed, are not eaten and are replaced by foods containing added sugars.

Carbohydrate Restriction & Regulation:

There are two types of dietary CHO restriction

1-General: the total amounts of CHO consumed per day and possibly per meal, have to be either restricted [type IV hyperlipidemia] or regulated [DM].

2-Specific: the intake of one or more types of CHO must be either severely restricted or eliminated from the diet as a result of specific intolerance.

Carbohydrate intolerance is the inability of the small intestine to completely process the nutrient carbohydrate (a classification that includes sugars and starches) into a source of energy for the body. This is usually due to deficiency of an enzyme needed for digestion.

Carbohydrate intolerance can be
congenital
Primary
secondary.

Congenital deficiency is caused by an enzyme defect present at birth.

- **Primary deficiency** is caused by an enzyme defect developed over time. The most common is lactose intolerance.

- **Secondary deficiencies**, often caused by a disease or disorder of the intestinal tract, disappear when the underlying cause is treated.

Secondary deficiencies include protein deficiency, pancreatitis, celiac disease , short-bowel syndrome, and some intestinal infections. Chronic renal failure and certain medications also can cause secondary deficiencies.

Carbohydrate intolerance caused by temporary intestinal diseases disappears when the condition is successfully treated. In primary conditions, no treatment exists to improve the body's ability to produce the enzymes, but symptoms can be controlled by diet.

- **Sucrose Avoidance : many sources of dietary sucrose are readily apparent like table sugar & obviously sweetened foods, most fruits, many vegetables must also eliminate from diet.**

Infants will require a milk formula in which sucrose is replaced by glucose.

Lactose Intolerance

Lactose intolerance results when the mucosal cells of the small intestine fail to produce lactase that is essential for the digestion of lactose.

Symptoms include diarrhoea, bloating, and abdominal cramps following consumption of milk or dairy products.

In infants, switching to soy-based formula may help. Special formulas, such as a glucose polymer-based formula, or a casein-based formula, may be recommended in infants with severe carbohydrate intolerance or when symptoms are severe.

It is also present in some medications & artificial sweeteners.

For those who are sensitive to even very small amounts of lactose, the lactase enzyme supplement is available.

- The supplement is available in liquid form for use with milk.
- The addition of a few drops to a quart of milk will reduce the lactose content by 70 percent after 24 hours in the refrigerator.
- Heating the milk speeds the process, and doubling the amount of lactase liquid will result in milk that is 90 percent lactose free.

- Lactose-reduced milk and other products are also available in stores. Lactose-reduced milk contains the same nutrients as regular milk.

Because dairy products are an important source of calcium, people who reduce or severely limit their intake of these foods and beverages may need to consider other ways to consume an adequate amount of calcium.

Taking calcium supplements or choosing other foods high in calcium may be needed to meet the recommended daily requirement of calcium.

In addition, foods high in vitamin A, riboflavin, and vitamin B 12 should be included in the daily diet to compensate for the nutrients normally found in cow's milk.

- **Galactose Avoidance: avoidance similar to lactose intolerance, all milk and its products.**

- **Starch Avoidance: primary starch intolerance is due to iosmaltose deficiency and usually associated with sucrose intolerance. This will require exclusion of sucrose containing foods, in addition to flour and food containing flour (bread, cake), breakfast cereals, rice, potatoes, and many manufactured meat products [sausages].**


FIBER

The edible parts of plants or analogous carbohydrates that are resistant to digestion and absorption in the human small intestine, with complete or partial fermentation in the large intestine.

Dietary fiber, like starch are polysaccharides in plant foods, that can not be digested by humans, so fiber' pass through' our bodies without providing calories or nutrients.

Its texture provides bulk that thickens chyme and eases the work of (GI) muscles that regulate the movement of the food mass. Although human digestive juices can not digest fiber , micro flora that normally reside in the colon utilize fiber as a medium for microbial fermentation, resulting in the synthesis of vitamins and the formation of short chain fatty acids [SCFA].

Several vitamins including K, biotin, B12, folate & thiamin are synthesized by the bacteria in the colon.

Dietary fibers are divided into two categories based on their solubility in fluids:

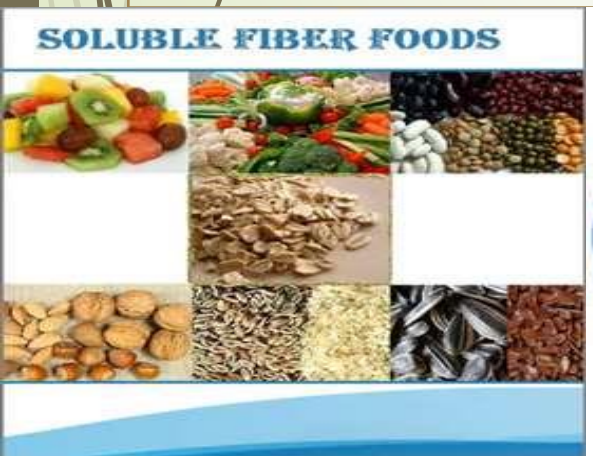
1. **Soluble dietary fiber → apples, pears, bananas, grapes, citrus fruits [orange& grape fruits], carrots and corn.**

It has a beneficial effect on body chemistry, such as lowering blood cholesterol and blood sugar levels.

2-Insoluble dietary fiber→ whole grains, whole wheat flour, pop corn, nuts, peanuts butter, leafy green vegetables.

It has a good laxative action.

Sources of dietary fiber	
Soluble Fiber	Insoluble Fiber
beans	whole grains vegetables
oat bran	beans
fruits	Bulgur or whole grain cereals
vegetables	Brown rice



HEALTH EFFECTS OF FIBER

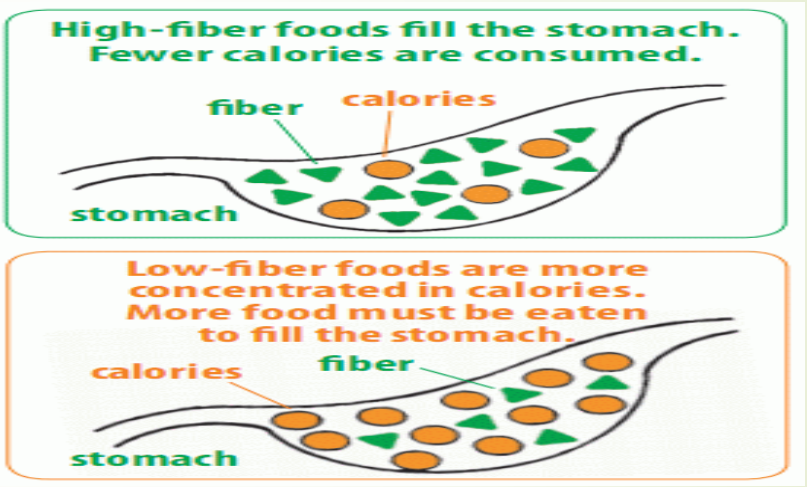
All the health benefits of fiber improve the physical functioning of the human body.

The benefits are not directly nutritional, but instead allow the body to function at more efficient level.

Getting enough fiber in the diet can lower the risk of developing certain conditions

- **Reducing cholesterol**. Fiber's presence in the digestive tract can help reduce the body's cholesterol absorption. This is especially true if person take statins,

•Promoting a healthy weight. High fiber foods like fruits and vegetables tend to be lower in calories. Also, fiber's presence can slow digestion in the stomach to help person feel fuller for longer.



•Adding bulk to the digestive tract. Those who struggle with constipation or a generally sluggish digestive tract may wish to add fiber to their diet. Fiber naturally adds bulk to the digestive tract, as your body doesn't digest it. This stimulates the intestines.

- **Reducing gastrointestinal cancer risk. Eating enough fiber can have protective effects against certain cancer types, including colon cancer. There are many reasons for this, including that some types of fiber, such as the pectin in apples, may have antioxidant-like properties.**

  Other types of cancer that are linked with over nutrition and may be prevented by a fiber-rich diet include breast cancer, ovarian cancer, and uterine cancer

- **Promoting blood sugar control. It can take body longer to break down high fiber foods. This helps to maintain more consistent blood sugar levels, which is especially helpful for those with diabetes.**

GALLSTONES AND KIDNEY STONES: Rapid digestion leads to a rapid release of glucose (sugar) into the bloodstream.

To cope with this, the body has to release large amounts of insulin into the bloodstream, and this can make a person more likely to develop gallstones and kidney to diabetes and high cholesterol stones (in addition to diabetes and high cholesterol

Some medical conditions do not benefit from a high-fiber diet.

Raw bran increases the excretion into the stools of calcium, iron, and zinc. For most people eating a good balanced diet, this is of no consequence.

But theoretically, it might lead to depletion of these minerals in pregnant and breast-feeding women, and in people with small appetites.

Such people should take calcium supplements or extra milk or cheese if they are taking bran regularly.

The Academy of Nutrition and Dietetics recommends consuming about 14 grams of fiber for every 1,000 calories consume daily. This translates to roughly 24 grams of fiber for women and 38 grams for men

RDA **Fiber recommended intake levels of 20-35 gram per day.**

About 2g/ serving: apricot, banana, carrot, cauliflower, grapefruit, whole wheat bread.

About 3g/ serving: apple with skin, orange, peas, pear.

THE FIBRE CHALLENGE

Download

3 Apricots

10 Blackberries

2 dried or fresh Figs

3 Prunes

2 Kiwi Fruit

1 tablespoon of Raisins

2 slices of Mango

1 Pear

1 medium Banana

1 Orange

Fibre Foods

Fruit

1 slice Pineapple - 1.0 g
1 handful of Grapes - 0.5 g
1/2 an Avocado - 2.5 g
1 Peach - 1.0 g
1 medium Apple - 1.5 g
10 Cherries - 0.5 g

This is not an exclusive list of high fibre foods

Fibre Content (grams)

Household Measure

Some tips to startup intake of dietary fiber

1- Use whole fruits more often than fruit juice. Fresh, frozen, or canned

2- Eat two vegetables with evening meal

3- Carrots, cucumbers for a quick snack

4-Make a meal around dried beans or peas (also called legumes) instead of meat

5-Choose whole grain foods more often

6-Start day with a whole grain breakfast cereal low in added sugar or whole grain bread

7-A dietary supplement of fiber products such as *Citrucel* or Metamucil, which are mixed with water and provide about 4 to 6 grams of fiber in each 8-ounce glass

8-Drink plenty of water - at least eight glasses a day