

Faculty of Pharmacy

Microbiology and Immunology Department

A background image showing several hands of different skin tones holding up large, colorful letters that spell out 'Diabetes'. The letters are in various colors: blue, purple, red, green, yellow, pink, and red. The hands are positioned as if they are presenting the word.

**Diabetes
Public Health Course
Students**

Year 2016/2017
Spring 2017

Under the Supervision of

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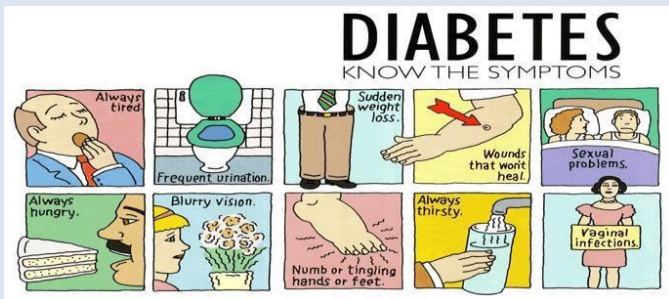
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Types of Diabetes

Type 1 Diabetes Mellitus :

The main problem is in the pancreatic cells which don't make insulin at all or there is no sufficient insulin and this may be due to hyperactive immunity system that will attack that cells.

The treatment is only based on taking insulin every day. Almost 90-95% of diabetic patients have type 2 diabetes. In this type the body prevents the insulin from doing its job as there is no sufficient insulin. This type may happen to people who have a family history of diabetes, elder people (45 years old or older), and physically in active and overweighted person.



Type 2 Diabetes Mellitus

This type could be prevented by eating healthy low fat meals, to be physical active, and screening or high level of blood sugar.



Gestational Diabetes:

The cause of gestational diabetes is when the woman is pregnant she releases special hormone that may cause resistance to the insulin in her body, the body will try to compensate to this problem by producing more insulin but it isn't enough yet to handle that extra amount of sugar.

This type of diabetes have many problems on the baby as it may cause injures to the baby during delivery, hypoglycemia, jaundice, breathing problems, or may develop type 2 diabetes later in the baby's life.

This type also have some risks on the mother as it may continue to cause T2DM later after delivery, hypertension, or it may necessitate the need of caesarean surgery.



Types of Diabetes

| | Type 1 Diabetes | Type II Diabetes |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Contributing Factors | This may be due to genetic and environmental risk factors, viral infections or family history | Lack of exercise, overweight, gestational diabetes, genetics and obesity |
| Plasma Insulin | Low | High at early stages and low in longer duration |
| Symptoms | <ul style="list-style-type: none">-Polyuria-Fatigue-Weight loss-Foot problems-Polyphagia-Glucosuria | <ul style="list-style-type: none">-Waking with headache-Fatigue-High blood pressure-Slow wound healing-Blurred vision |

| | | |
|----------------------|-------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Complications | Ketoacidosis, Hypoglycemic Coma, Blindness, Heart diseases, Foot damage and Nephropathy | Hyperosmolar coma , Damage to body blood vessels that cause blindness, nephropathy, retinopathy, amputation and early death |
| Treatment | Insulin therapy injected subcutaneously by pens or syringes to control hyperglycemia and ketoacidosis | Lifestyle modifications by eating healthy and exercise and oral hypoglycemic drugs like metformin & glimepiride |

Food as lifesaving
agent and its
unhealthy hazards

1) Healthy food and Good Eating Habits

Food is defined as any solid or liquid which has the capability to build and maintain body tissues, after being ingested, digested and absorbed. Nutrients can be classified into essential nutrients not formed by the body and non-essential nutrients that can be easily formulated in the body from other materials. In general nutrients can also be classified into two main titles: the **macro nutrients and micro nutrients**.

It is clearly known that the daily caloric intake and its sources have a great effect on the people health status and on their weight. According to the world health organization: healthy diet, increasing physical activity and smoking cessation can play a great role in preventing 90% of type 2 diabetes and 30% of all of cancer cases

According to the Dietary Guidelines for Americans (2010)
published by the US

Department of agriculture and the U.S. Department of Health and
Human Services

- 1. One should maintain and keep the energy balance**
- 2. Concentrating on nutrient-rich foods**
- 3. Reduce added sugars, solid fats, and sodium**
- 4. Increasing physical activity**

As for Diabetes healthy food and good dietary habits, simply means eating the healthiest foods in moderate amounts and sticking to regular mealtimes. A diabetes diet is a healthy-eating plan naturally high in nutrients and low in the caloric number and the fats. The diet key elements are vegies, whole grains, and fruits. Indeed, this eating plan is the best for almost any person.

What is diabetes meal plan? It is a guide which shows you the type and the amount of food that can be added to your daily dietary intake. A good meal plan should fit in with your eating habits and your schedule [5]. Example on these plans: The plate method (figure 1)

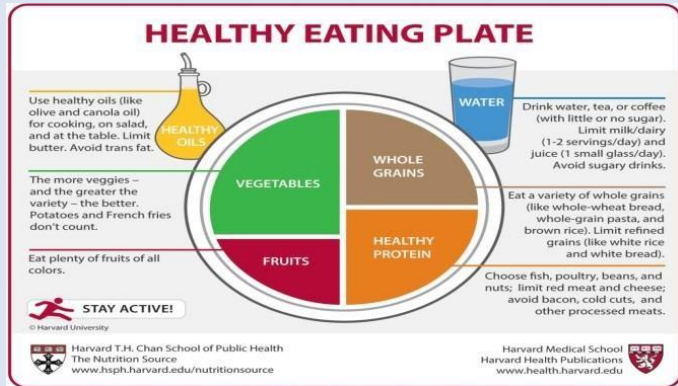


Fig.1. Healthy Eating Plate

Carb counting method: Carbohydrates are the most important factors that have a great effect on your blood glucose level, since it is broken down giving the glucose. In order to control your blood glucose level, try to have the same amount of Carbs each day, at regular intervals.

- **Glycemic index:** This one depends on the carbohydrates effect on the blood glucose level, and making ranks between the carbs in relation to your glucose level over a certain period of time.

- **Recommended foods (patient can count his calories with these foods)**

Healthy carbohydrates: Carbs are having a great effect on our blood glucose levels, so choosing the type of carbohydrates source has a great impact on your glucose level. You should limit refined Carbs such as Rice, Pasta, white bread, candy, snacks, and soda. Choosing slow-release carbs is also very important as they are slowly metabolized leading to the production of little amount of insulin over long time. E.g. on the healthy carbs are the whole grains, legumes (peas, beans), low fat dairy products, vegetables, and fruits.

Fiber-rich foods: it includes all the plants parts which can't be digested, but it can control they blood glucose levels. E.g. vegies, fruits, legumes and the whole-wheat flour.

Eat heart healthy fishes: it can be a good substituent for red meat (having high fats), at least two times per week. E.g. Tuna, Salmon (rich in omega-3), cod, and halibut (less cholesterol, and saturated fats than poultry and red meat do). But the person should avoid fishes having high level of mercury like king mackerel, and avoid the fried one.

Food containing good fats: Foods containing monounsaturated & poly- unsaturated fats may have an effect on lowering the cholesterol. E.g. avocados, walnuts, almonds, and olives. Increasing their intake may worsen your case, since all fats are rich in calories.

Get more active and avoid smoking: Exercise is an important factor that helps in weight loss and in increasing the insulin sensitivity. The simplest way is to walk for thirty minutes a day (it can be divided for 10-minute sessions three times daily), swimming, and biking, can also be a good way.

II) Unhealthy Food and Bad Eating Habits

Choices of food for diabetic patients are very important. Unhealthy food and bad eating habits may lead to worsen the diabetes disease condition and also may even lead to occurrence of diabetes to non-diabetic people so we will list some of these unhealthy foods that should be avoided in patient with diabetes.

Junk foods contain a high amount of calories, fats and sugar which may lead to obesity and also lead to large increase in the blood glucose level.



Whole milk contains a lot of saturated fats which can be dangerous to diabetic patient so diabetic patient should drink non-fat milk.



Foods having high glycemic index (GI) which metabolized to give a high amount of sugar *like*: **White rice and Pasta** have a high amount of carbohydrates which cause elevation in blood glucose level. Also, **Chinese foods** which contain high level carbohydrates, salts and fats that elevate the level of glucose in the blood.



Food containing saturated and trans fats it increase the level of cholesterol and put the patient on risk of heart disease and diabetes.

White bread which made from white flour that cause increase in blood sugar level.



Sweet drinks containing large amounts of sugars



Ketchup has an amount of sugar and it can lead to increase in blood glucose level.



Potatoes contain too much starch (it's called starchy vegetable).



Snack Cakes and Pastries consist of sugar and white flour that can elevate the blood glucose level.



Dairy products involve cottage cheese; ice cream and yogurt have a bad effect on patient with diabetes as it may increase the level of glucose in blood.



There are a lot of bad eating habits that may cause diabetes like:

If the person has a bad emotion, he will eat more food so **emotional eating** is considered a bad during diabetes as eat more food can cause imbalance in sugar level in the body.

Skipping breakfast cause lowering the blood glucose level too much and increasing the insulin and also other hypoglycemic drugs level in blood as may lead to occurrence of hypoglycemic coma which is dangerous for the diabetic patients.

Midnight eating raises blood sugar level and disturbs secretion of insulin

Consuming unhealthy fats unhealthy fats found in high quantities in fast food and food that contains semi-hydrogenated oils which can worsen diabetes.

Irregular eating regimen eating in irregular hours would be the cause of unwanted changes in the level of blood sugar which finally worsen diabetes.

Aerated and sugary drinks Caffeinated and aerated drinks that are consumed during meals is a highly unhealthy habit that causes obesity and increase the risk of diabetes.

Ignoring fruits and vegetables Fruits and vegetables are rich in fibers that help the body to control the level of sugar so, ignoring them cause imbalance in sugar level and also cause diabetes.

III) How diabetes is formed in consequence to unhealthy food

Unhealthy food or junk food is a high calorie type of food which lacks in micro- nutrients such as proteins, vitamins, amino acids, fibers and essential minerals.

Junk food consumption is one of the related factors to its spreading. Junk food is considered big risk factor for type -2 diabetes, especially with overweight people who in addition lack of their physical activity. Mostly this type of food doesn't contain the nutritional value that the body needs. Usually these foods contain high levels of white flour, salt, refined sugar, food additives such as monosodium glutamate and a high fat content (trans fat and polyunsaturated fat).

The food that may cause this type of diabetes:

1) Carbohydrates:

Carbohydrates are broken down into glucose entering the blood stream. As the level of the blood sugar rise, chronic hyperglycemia leads to releasing free radicals and oxidative stress. Thus, causing apoptosis and damaging of Beta cells in pancreas that releases insulin.



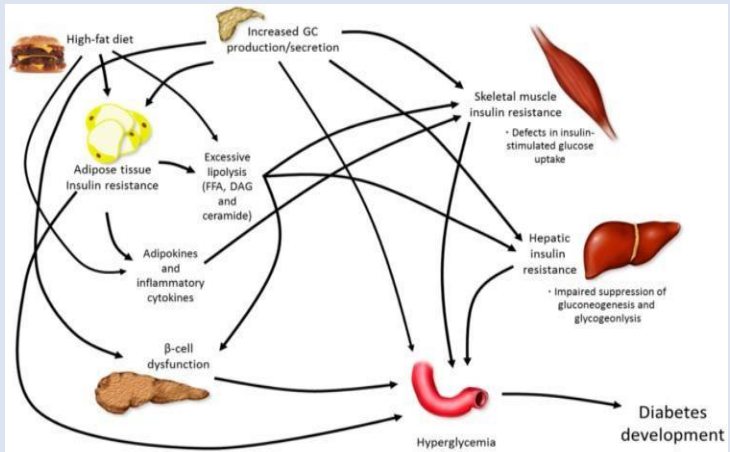
The high levels of sugar in junk food which puts metabolism under stress. This stress causes secretion high amount of insulin from pancreases. High insulin secretions cause suddenly drop of blood sugar level after eating of junk food , leading to craving for sugar and fatigued feeling . Studies have found direct relation between high sugar level, obesity and diabetes.

According to Eliaz Food which contains high amount of carbohydrates as bread, pasta, rice cakes, potatoes and pizza increase the amount of glucose in blood which lead to uncontrolled blood glucose levels as the pancreases release amount of insulin which don't be able to regulate and reduce the blood glucose levels. Highly carbohydrate food is the fastest cause for elevating the blood glucose levels.

2) Fats:

Trans and Unsaturated fats which are formed from partial hydrogenation of fats present in crackers and cookies can elevate cholesterol level in the blood that is one of the main risk factors of type 2 diabetes. Medical experts and doctors believe that overweight around the waist and general obesity is the primary and main cause of insulin resistance. Many studies have shown that fat tissues has a serious effect on health , researchers found that belly fat stimulates production of hormones and other substances that contributes to health problems like high blood pressure ,insulin resistance and imbalanced cholesterol levels.

Dense calories are oxidized in the body cause formation of acetyl CoA. Acetyl CoA in excess participate in other metabolic pathways. These pathways include cholesterol biosynthesis and synthesis of de novo fatty acid, which causes excess formation of fatty acid and cholesterol .studies have found direct relation high cholesterol level , obesity and diabetes.



3) Sugar sweetened drinks:

Beverages which contain highly amount of sugar whatever its type soda drinks, juices, tea and coffee it's directly associated with diabetes type two according to Jill.

It's proved that drinking two drinks with sugar within day increases the risk of diabetes mellitus type two by 26 %.

4) Red meat:

Red meat as burgers, bacons, hotdogs and deli meat have high level of sodium which is linked to diabetes type two.

Development of type II diabetes:

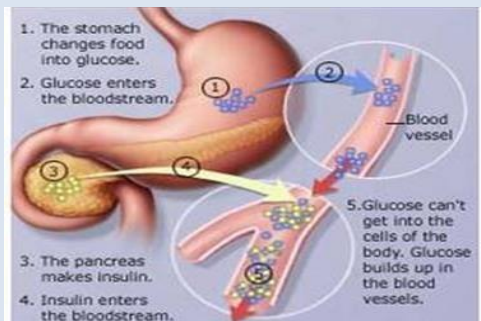
There are several risk factors that may lead to diabetes such as race, age; pregnancy and stress, there are other medication that can cause diabetes and family history of diabetes and other genetic factor. 90% of people who have diabetes, they are obese. People who are obese or overweight have added pressure on the body to use insulin to control the level of glucose.

The regular usage of this unhealthy food can raise blood cholesterol level significantly due to the high levels of trans fats and unsaturated fats found in unhealthy food.

There is common misconception even among health conscious people that all fats are bad. There is always misunderstanding between the good fats and the diabetes causing fats. Again, olive oil is a healthy source of unsaturated fats. However, saturated fats found in dairy and animal products. These are also referred to as trans-fats and are found in heavy quantities in packaged, fast food items. Red meat, dairy products and foods containing semi-hydrogenated oils are unhealthy.

The unhealthy food contains saturated fats that can donate to weight gain and cause obesity. The possibility of developing pre-diabetes and type 2 diabetes is increased by the occurrence of insulin resistance. The obesity is the main cause of type 2 diabetes. In the obese people their body yields enough insulin but the cell doesn't respond to the effect of insulin so the cell become resistant to the insulin and this make the sugar (glucose) accumulated in the blood

This accumulation can cause severe long term problems on the organs as well as the kidney and this can result in diabetic kidney disease. For the treatment of this disease the blood sugar level must be lowered by blocking the glucose reabsorption in the kidney. The overweight can also make a stress inside the individual cell mainly make a stress in endoplasmic reticulum; it is a membranous network inside the cell. So when the endoplasmic reticulum have more processes than it can handle (nutrients), it sends a signal to know the cellowering the insulin receptors on the surface of the cell. This process named as the insulin resistance and this make the blood sugar high.



Ignoring healthier food choices:

Ignoring healthy food is a major risk factor contributing in the development of type II diabetes mellitus. Normally people tend to eat unhealthy food as junk food instead of healthy food at which this unhealthy food is not time consuming and it's rapidly and also they have great taste due to the large number of additives that are added to the food.

Here are some of the wrong choices of foods and drinks that can lead to development of diabetes mellitus:

- Tendency to skip reading the ingredients put on the packaging of food in market. Many ingredients lead to a huge sugar intake and these products should be prevented.
- Tendency to snake upon artificially sweetened packaged food over the natural sources of sweeteners like fruits.
- Over frying food which can cause an excessive intake of harmful trans-fats.

Preventing obesity:

The link between type 2 diabetes and obesity can be ended by using diet and exercises and reducing body weight to improve the sensitivity of the body to the insulin and decrease other risk factors such as heart diseases and cardiovascular diseases, According to the NHS, when the patient reduce the body weight about 5%, there will be regular to moderate intensity exercise to reduce type 2 diabetes.

Prevention and control
measures of diabetes
problem

A) Prevention of Diabetes

Type 1 diabetes

Type 1 diabetes is not prevented, because it is considered auto-immune disease. Healthy lifestyle choices are assisting to reduce and prevent gestational diabetes and type 2 diabetes.

How to prevent type 2 diabetes:

There are three main types of prevention:

- Primary prevention.
- Secondary prevention.
- Tertiary prevention.

Primary prevention:

The main aim is to increase the physical activity and control the body weight to control type 2 DM. they also decrease the high blood pressure and the incidence of heart diseases. To add on, community awareness shows the primary prevention through the following:

- Avoid smoking.
- Avoid healthy weight.
- Following a healthy and physically active lifestyle.
- Early identification of risk factors of DM.



Secondary prevention:

The main aim is to identify the individuals who have the disease but the symptoms are absent. It has an extra role in controlling the blood glucose level and decreasing the diabetic complications such as renal diseases, stroke and blindness.

Tertiary prevention:

This kind aims to delay or prevent the onset of diabetic complications. They include effective treatment, good education and diet control. They also involve the screening of early phases of these complications. Furthermore, it is reported that this kind is the most effective one since it provides the treatment of diabetic retinopathy by using the laser photocoagulation technique, for instance.



2) Management and control of diabetes mellitus:

Symptoms alone aren't enough to manage diabetes mellitus. Glycemic goals are based on evidence of what glucose levels constitute a risk for developing complications. It is, however, inappropriate to aggressively approach target glucose levels when it may adversely affect the patient. So Treatment goals must be individualized.

The goal of treatment is to control blood glucose level and avoid further complications.

The main objectives of therapy for diabetes mellitus are:

- To remove the hyperglycemic symptoms
- To reach optimum control
- To reduce or eliminate macrovascular and microvascular complications of diabetes mellitus.

-To treat associated diseases

-To help the patient to achieve normal lifestyle as much as possible.

Managing Diabetes Mellitus:

- 1) Choose food that is high in fibers.
- 2) Do exercise regularly
- 3) Take your medication and your meal on time according to your doctor
- 4) Don't skip meal it may lead to large swing in blood sugar level
- 5) Choose food that is low in fat and saturated fat and low in sugar and sodium
- 6) Foot care
- 7) Use Insulin pump which pumps small and continuous doses of fast acting insulin.



