

## Diabetes mellitus -Type 2 and It's dietary management

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The nations fourth largest killer after heart disease, cancer and stroke is diabetes mellitus. China and India the emerging superpowers are thought to be the major victims of such diseases, which are associated with unhealthy lifestyle. World Health Organisation (WHO) and International Diabetes Federation (IDF) have ranked India - No.1 among the top 10 countries in people with diabetes, followed by China & USA. India already has 35m diabetics, the largest number for any country, and by '25, WHO estimates the figure to go up to 73.5m. Diabetes is becoming a major threat to global public health, as it is regularly getting worse due to an increasing trend towards unhealthy diet & sedentary lifestyle.

### Diabetes Mellitus and its major types

Diabetes Mellitus, a serious chronic disease, characterised by abnormalities in the metabolism of carbohydrate, protein and fat is caused by lack of insulin that is produced by  $\beta$ -cells of pancreas. Insulin is a carrier of glucose from the bloodstream to cells that rely on glucose for energy. When the pancreas does not produce enough insulin or when the body is unable to effectively use the insulin it produces, there is an accumulation of sugar in the blood and the condition of diabetes mellitus arises. Pancreatic damage by viral infections or due to genetic factors disables  $\beta$ -cells to produce insulin and leads to type 1 diabetes, also known as IDDM (Insulin dependent diabetes mellitus) as the patient has to rely on an exogenous source of insulin for survival

The other type of diabetes mellitus is type 2, also known as NIDDM (Non Insulin Dependent Diabetes Mellitus). This condition can be managed with lifestyle measures alone, but oral drugs and insulin are often required to achieve a good metabolic control. The third type of diabetes is gestational diabetes mellitus, develops during some cases of pregnancy but usually disappears after pregnancy.

### Type 2 diabetes mellitus

“Prevention is better than Cure”, Type 1 diabetes is unpreventable, it can only be controlled by insulin injections, thus we will focus mainly on type2 diabetes mellitus which is the most preventable form of diabetes and 95% diabetics have this condition.

Type2 diabetes is the most frequently spotlighted because it is essentially preventable by dietary control and exercise. Research has shown that during pre-diabetes if an action is taken to manage blood glucose, type 2 diabetes can be delayed or prevented from ever developing. But the dilemma is that almost a third of people with diabetes do not even know that they are suffering with diabetes because like its partners in crime, high blood pressure, high cholesterol, high blood sugar is not associate with obvious symptoms. Very general symptoms, which include excessive thirst, constant hunger, excessive urination, weight loss for no reason, rapid hard breathing, vision changes, drowsiness occur suddenly and many have no symptoms at all, they are diagnosed after many years of onset. Early diagnosis and effective management can prevent type 2 diabetes. It is very important to control diabetes as uncontrolled diabetes over a long term can lead to blindness, impotence, kidney damage, poor circulation and nerve damage which may lead to amputation of limbs, heart disease and strokes.

Diabetes can be diagnosed with a simple blood test .If the Fasting Blood Glucose (Taken 10 or more hours after the last meal) is more than 110mg% and if the post prandial blood glucose (taken 2 hours after a full meal) is more than 140mg%, the person is diabetic. Blood glucose can be monitored at home using a glucometer.

### Dietary Considerations for Diabetics

Death can result from hypoglycaemic coma in diabetics and therefore utmost care should be taken in diet. Diabetics should always eat according to the plan. The desired end is a positive health, a regeneration of the body, and not merely an absence of symptoms. This is why it is important to remember to take food at correct, regular time. For those who are on oral drug therapy along with diet therapy, it is important to remember that they do not have to take extra medicine for extra food. Patients taking insulin or anti-diabetes tablets should be careful of their doses as hypoglycaemic or low blood glucose level can occur if the patient skips or delays a meal, does excessive physical exertion, or is ill and stressed

Although sugar has been labelled as a taboo for diabetics, it's more important to keep an eye on the total carbohydrate intake rather than on just the amount of sugar consumed. They can consume a modest amount of sugar, but this must substitute their carbohydrate intake and not be added onto it. A large intake of sugar laden processed and packaged foods should be avoided, as these are causative agents of obesity, which is considered as a major risk factor leading to diabetes and its complications. Obesity results from an imbalance between energy intake and energy expenditure. It is characterised by pathological accumulation of triglycerides thereby promoting insulin resistance in muscles, liver and other tissues. In type 2 diabetes, the ability of insulin to inhibit lipolysis is impaired that leads to increased FFA secretion into plasma, which induces insulin resistance.

According to ADA (American Dietetics Association), for type 2 diabetics the calories are restricted to 25-30 cal/Kg to bring down weight to normal range. Fats are restricted to 20 percent of total intake and adequate complex carbohydrates rich in dietary fibers should form about 60-65% of total intake. An intake of 25gm /100kcal or 40g dietary fiber per day from a variety of food sources is desirable .It provides physical barrier which protects carbohydrates from the digestive effects of enzymes. Fiber also releases a gastrointestinal insulin secretion namely GIP which enhances glucose-induced insulin secretion .It is also associated with improved peripheral insulin action by increasing insulin receptor binding. This way the oral drug or the insulin requirements are considerably reduced.

With the increase awareness of diabetes and importance of reduced blood sugar (glucose) levels, the consumers are now interested in only managing their blood sugar levels. Some consumers are choosing foods based on their glycemic impact, this ignorance of consumers has given a

boost to the low GI claimed food products. Before selecting a food, the consumer should keep in mind that a food's glycemic impact alone cannot be used to establish benefits delivered by low-insulinemic foods and foods that help maintain insulin sensitivity.

### **Plant Based Supplements for diabetes**

The NMI (Natural Marketing Institute) reports that nearly 4 in 10 US adults now express a desire for foods that help manage blood sugar and a natural way to cure their disease. This is excellent news and a hope of a strong future for the market for supplements and functional foods addressing healthy blood sugar.

Consumers who are looking for natural and healthy alternative to deal with this critical problem have a large range of nutraceuticals and plant based supplements to choose from. There are a few plant-based supplements that have proved to have a positive effect in controlling diabetes.

GlucFit and GlucoHelp are products of banaba leaf extract which contains corosilic acid, as well as other compound that act as natural insulin like compounds. These compounds act through the mechanism of facilitative glucose transport. Corosilic acid stimulates the translocation of glucose uptake mediators, specifically GLUT-4 protein, to the cell membrane. GLUT-4 allows glucose and protein to enter the cell. Poor GLUT-4 function is an aspect of insulin resistance and may figure prominently in the development of diabetes

Viscofiber from Cevena Bioproducts is the highest –viscosity beta-glucan supplement currently available. Compounds such as beta-glucans form a viscous gel with food in the stomach and small intestine, making it more difficult for digestive enzymes to break down food, which also delays the release of glucose; they may also form a protective layer along the intestinal wall which slows absorption. When digestion is delayed, blood sugar increases more slowly, causing a low insulin response. Natureal Oat Bran Concentrate from GTC Nutrition is another nutraceutical high in beta-glucan and working on the same principles.

FenuLife, Acatris, is an odourless extract of fenugreek galactomannan, which gives formulators large amounts of galactomannan (a type of soluble fiber), and thus can help diabetic individuals.

Cinnulin PF, Integrity Nutraceuticals International, the only patented and USDA tested, is a natural cinnamon water extract. Studies conducted at the Universities world wide illustrated the benefits of cinnamon, including the prevention of insulin resistance, and improved glucose and lipid profile. It was also found that polyphenolic polymers in cinnamon water extract function as antioxidants, potentiate insulin actions and benefit in the control of diabetes. Cinnamon PF is unique in that it contains double linked polymers rather than single.

### **Anti diabetic drugs**

Anti –diabetic drugs are prescribed by physicians mainly to type 1 diabetic and those type2 diabetics whose blood glucose cannot be controlled by diet and exercise alone. Two classes of anti-diabetic oral drugs are usually administered-sulphonylurea and biguanide. Sulphonylureas work by stimulating the pancreases to release more insulin. Non –obese patients with typoe2 diabetes are usually prescribed this. Biguanides work by increasing insulin sensitivity and glucose utilisation and reducing the amount of glucose produced by the liver. Obese patients with type-2 diabetes are usually prescribed biguanides.

- Sulphonylureas
  - Glibenclamide-Daonil, Diabetnil, Euglucon, Glyboral and Glinil
  - Glipizide-Glynase, Diaglip, Glide, Gluctrol, Glibetic
  - Glicazide-Glucigon, Reclide, Glizid, Dianorm, Diamicron
- Biguanides
  - Metformin-Glycomet, Gluformin, Walaphage, Glyciphage, Obimet

There are a few side effects to these drugs, apart from the danger of hypoglycaemia; some people are allergic to sulphonylureas. Biguanides like metformin can cause gastrointestinal upsets, weight loss and vomiting.

There is a new, potential alternative for the millions of diabetics who take insulin injections. The Us Food and Drug Administration (FDA) has approved the first ever inhaled insulin –Exubera, which is an inhaled powder form of recombinant human insulin (rDNA). Like any insulin product, low blood glucose is a side –effect of Exubera. Other side –effects include cough, shortness of breath, sore throat and dry mouth. It is manufactured by Pfizer.

### **Alternative Medication**

Since antiquity, diabetes has been treated with plant medicines. Recent scientific investigation has confirmed the efficacy of many of these preparations, some of which are remarkably effective. Following are some of the alternative approaches that will serve as a compliment in management of diabetes.

***Pterocarpus marsupium (Indian kino, Venga, Pitasara):*** This herb has a long history of use in India as a treatment for diabetes. The flavonoids, (–) epicatechi, extracted from the bark of this plant has been shown to prevent alloxan-induced  $\beta$ -cell damage in the rats. Both epicatchin and a crude alcohol extract of pterocarpus marsupium have actually been shown to generate this activity.

***Gymnema Sylvestre (Gurmar):*** Gymnema assists the pancreas in the production of insulin in type 2 diabetes. Gymnema also improves the ability of insulin to lower blood sugar in both type 1 and type2 diabetes. It decreases craving for sweet. This herb can be an excellent substitute for oral blood sugar –lowering drugs in type 2 diabetes.

***Onion and garlic (Allium cepa and Allium sativum):*** Onion and garlic have significant blood sugar lowering action. The principal active ingredients are believed to be allyl propyl disulphide (APDS) and diallyl disulphide oxide (allicin), although other constituents such as flavonoids

may play a role as well. APDS lowers glucose levels by competing with insulin for insulin –inactivating sites in the liver. This results in an increase of free insulin. Onions affect the hepatic metabolism of glucose and /or increases the release of insulin, and/or prevent the insulin’s destruction.

**Asian Ginseng:** Asian ginseng is commonly used in traditional Chinese medicine to treat diabetes .It has been shown to enhance the release of insulin from the pancreas and to increase the number of insulin receptors .It also has a direct blood sugar lowering effect.

**Stevia:** Stevia has been used traditionally to treat diabetes. Early reports suggested that stevia might have beneficial effects on glucose tolerance and therefore potentially help with diabetes although not all reports have confirmed this. Even if stevia did not have a direct antidiabetic effect, it’s use as sweetener could reduce the intake of sugar in such patients.

**Bitter melon:** Bitter melon is said to have been used by the traditional healers to address diabetes. Three active constituents in bitter melon known as steroidal saponins –charntin, polypeptide-P and alkaloids are believed to be responsible for blood sugar lowering action.

**Jambul fruit (rose apple):** The jambul fruit is regarded as a traditional medicine against diabetes due to its effect on pancreas The seeds of the jambul contain a glucose which is believed to have the power to check excessive conversion of starch into sugar.

### **Diabetes and exercise**

The most important element in a diabetic management program after diet and medication is regular exercise. Exercise increases HDL-cholesterol levels and decreases triglycerides levels. Moreover, exercise improves circulation and strengthens the heart. It induces a fall in glycogen content leading to a stimulation of glycogen resynthesis in the liver and thereby a prolonged increase of glucose uptake from the blood. Replenishment of muscle and liver glycogen stores takes 24 to 48 hours. During this time there is improvement in glucose tolerance and diminished insulin requirements. These are the immediate benefits of exercise. Long term benefits include improved cellular sensitivity to insulin by increasing the number of receptor site in proportion. Regular light exercise burns off excess sugar and keeps your weight at optimum level. Eat adequate carbohydrate before exercise to avoid hypoglycaemia. Do not exercise if you have ketones in your urine, or an illness or infection, or excessive blood glucose (over 400mg/dl for NIDDM), or feel any constriction or pain round the chest or neck or a vision change.

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