Diabetes

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What is it?

Digestion breaks down most food into *glucose*, a kind of sugar that is the body's main source of energy. *Insulin*, a hormone produced by the *pancreas*, acts as the "key" that opens the door, letting glucose into cells. *Diabetes mellitus* (sugar diabetes or more commonly just *diabetes*) is a disease where the pancreas does not make enough insulin and/or the body is unable to use insulin correctly causing high blood glucose.

There are two types of diabetes mellitus – type 1 diabetes (previously known as juvenile diabetes) which accounts for less than 10% of people with diabetes, and type 2 diabetes (previously adult diabetes) which includes over 90% of diabetics.

What causes it?

No one knows the exact cause of diabetes. But we do know there are risk factors that can make you more likely to get diabetes. In particular, type 2 diabetes mostly affects people who are overweight (the single most important risk factor), are inactive, have other close family members with diabetes (2x risk), are over age 45, or are members of certain ethnic groups such as Native Americans (5x risk), Hispanic Americans (3x risk) or African Americans (2x risk). One half of women who had gestational diabetes during pregnancy or delivered a baby over 9 pounds develop diabetes later in life.

Who gets it?

Approximately 26 million Americans have diabetes, but 1/3 are undiagnosed. The US Preventive Services Task Force now recommends screening adults age 40-70 with BMI>25 as a part of routine cardiovascular risk assessment. In addition, approximately another 57 million Americans have *prediabetes* (formerly borderline diabetes). The lifetime risk of diabetes in the US is 33% for men and 39% for women.

What are the symptoms?

Sometimes there are no symptoms. But when there are symptoms, they usually come on slowly and include increased thirst and hunger, frequent urination, fatigue, blurred vision, frequent infections, and numbness in the hands or feet.

How do you prevent it?

Recent research suggests that diabetes might be preventable by maintaining proper weight along with regular exercise and a healthy diet. We already know these healthy habits can delay the disease in people who have inherited the tendency to develop diabetes.

Can it be treated?

Although there is no cure for diabetes, it can be controlled. No matter which type of diabetes you have, it is important to understand that diet and exercise form the foundation of any successful treatment plan. Medications can be added if diet and exercise alone are not enough. The goal of treating diabetes is to control your blood sugar level by keeping it as close to normal as possible, which has been shown to prevent or delay many of the long-term complications of diabetes. In general, sugar levels before meals should be between 70 and 120 mg/dl and not more than 160 two hours after meals. Follow the advice of your doctor. Take your medicine as directed. Keep track of your blood sugars and learn all you can about your diabetes.

DIET – The most important thing you can do is eat the right food, in the right amounts, at about the same time every day. Eat plenty of fiber. Fiber helps slow down the release of sugar into your blood after eating, so it helps control your blood sugar level. Avoid high sugar foods. Switch to sugar-free foods and drinks. Use sugar substitutes if needed. About 10-20% of calories should come from protein, less than 10% from saturated fats (which are solid at room temperature), up to 10% from polyunsaturated fats, and then 60-70% from carbohydrates. Daily cholesterol intake should be less than 300mg. And if you are overweight, losing even 5-10% of body weight can lower your blood sugar and cholesterol levels significantly.

EXERCISE – Exercise can lower blood glucose levels, help you lose weight, and improve your circulation, blood pressure, and heart health. It can also give you more energy, make you stronger, and help relieve stress. You can choose any nonstop activity that makes your heart and lungs work harder than normal. This is called *aerobic* exercise. Running, walking, swimming and cycling are all aerobic exercises. It is important to do some exercise nearly every day.

MEDICATION – With type 1 diabetes you will need to take insulin. With type 2, treatment starts with helping your body more effectively use the insulin it does make by reducing insulin resistance. In time, most people with type 2 diabetes produce less and less insulin. Therefore, treatment will change over time.

• **Biguanides** – Metformin works on the liver to keep it from releasing too much glucose, particularly at night when you sleep and between meals. It also helps your body use insulin better. Metformin has the advantage of not causing low blood sugar or weight gain and is very low cost. It can cause nausea or diarrhea in some people, but they usually lessen with time.

• **Sulfonylureas** are the oldest oral diabetes medications available since 1956. Glimepiride, glipizide and glyburide primarily work on the pancreas to make and release more insulin. They are inexpensive but may cause weight gain and low blood sugar or low sodium.

• **Meglitinides** repaglinide (Prandin) and nateglinide (Starlix) are similar to the sulfonylureas by primarily working on the pancreas to release more insulin. However, they are quicker acting to more closely match the release of glucose after a meal which reduces the chance of blood sugar dropping too low. However they are relatively high cost.

• **Alpha-Glucosidase Inhibitors** acarbose and miglitol work in your intestines to slow absorption of carbohydrates. They do not promote weight gain and are safe in patients with chronic kidney disease. However side effects include excess gas, abdominal discomfort, and diarrhea plus they are moderate in cost. They tend to be less effective than most other diabetes medicine.

• **Thiazolidinediones**, also known as "glitizones" help your body use insulin more effectively by decreasing insulin resistance, primarily in fat tissue. Currently pioglitazone (Actos) is the only agent currently available. It can be very effective in patients who maintain strict diet control, but obese patients often gain weight. Side effects include fluid retention and worsening cholesterol.

• **DPP-4 inhibitors** sitagliptin (Januvia), saxagliptin (Onglyza) and linagliptin (Tradjenta) work only when blood sugar is elevated after meals to stimulate more insulin from the pancreas, control production of glucose by the liver, and control appetite. They are not associated with significant side effects, but do not promote weight loss, are expensive, and have relatively modest effect.

• **Sodium glucose cotransporter 2 inhibitors (SGLT2)** work by reducing the glucose reabsorption in the kidney and increasing elimination of sugars in the urine when blood levels are high. They can cause weight loss and do not cause low blood sugar. The first agent, canagliflozin (Invokana), was approved in early 2013. The most common side effects are vaginal yeast infections, urinary tract infections, and dizziness.

• **GLP-1 analogs** exanatide (Byetta), liraglutide (Victoza), and dulaglutide (Trulicity) stimulate insulin secretion only after meals in addition to controlling glucose release from the liver and slowing stomach emptying. They have been shown to result in progressive weight loss in some patients. Disadvantages include injections, very high cost, and commonly nausea. Rare cases of pancreatitis have been reported.

• **Insulin** works directly at the cell level to open the door for glucose to enter. Insulin has been used since 1921 and is the most effective medication to lower blood sugar. Newer synthetic insulins closely mimic the natural production of insulin, adjust dosages easily and are available in convenient pens. They are moderate cost.

• **Amylin analogs** – pramlintide slows absorption of carbohydrates and suppresses glucose output from the liver. It is injected before meals at the same time as insulin. Weight loss can occur. Nausea is the most common side effect along with unpredictable low sugar.

Are there complications?

Diabetes can cause serious health problems, often without symptoms. These problems usually develop after many years of having constant or repeated high blood sugars. When blood sugar levels are high it causes damage to the small blood vessels in the body. Organs that are particularly dependent upon small vessels are affected most often and most severely. Complications of diabetes include: ***Nephropathy*** – kidney damage in which the kidneys can no longer filter wastes as effectively and may eventually fail leading to dialysis; ***Retinopathy*** – eye disease leading possibly to blindness; ***Neuropathy*** – nerve damage which can cause numbness, tingling, or a burning feeling in the feet and legs; ***Vasculopathy*** – damage to the blood vessels to the brain or legs which can cause stroke or amputation; and ***Cardiomyopathy*** – blockages in the blood vessels of the heart known as *atherosclerosis* which can lead to heart attacks. The best thing to prevent these problems is to take good care of yourself and keep your blood sugars in control. Most diabetics over 30 should also take low dose aspirin.

Most complications can be prevented. You should have your long-term glucose control (*A1C*) checked by your doctor every 3-6 months with the goal generally being 6.0%-7.0%. Your cholesterol (a risk for heart disease, goal LDL<100), urine protein (a sign of kidney damage), and eyes should be checked yearly. You should get into the habit of examining your feet every day, and they should be checked for nerve damage by your doctor yearly. If you smoke, you should quit. And your blood pressure should be checked regularly, at least every 3-6 months, with the goal less than 140/80.

In summary

- Follow a healthy meal plan, exercise regularly, monitor your sugars, take medications as directed and see your doctor regularly.
- Know your diabetes goal ABCs – A1C, Blood pressure, Cholesterol LDL.
- For more information contact the Diabetes Education program at Bonner General Hospital, the American Diabetes Association in Spokane at (509) 624-7478 and at diabetes.org or the National Diabetes Education Program at ndep.nih.gov.