Can We Prevent Diabetes

This is not really a cardiac topic. However, diabetes and heart disease are so closely associated and this topic is quite relevant to this group. Therefore, I am sending you this.

Regulation of blood sugar is a tightly controlled process. Normally blood sugar is maintained in a narrow window between 70-140 mg/dL

FASTING STATE

In the fasting state, most glucose is produced by the liver- half from the breakdown of glycogen stores (which is the main storage form of glucose in the body) and half from gluconeogenesis (This is the process by which body makes new glucose from non-carbohydrate source). This glucose is used by the brain for fuel and by other tissues, such as gut and muscles. Production and uptake are balanced, maintaining fasting blood glucose level between 70-90 mg/dL

FED STATE

When we eat, carbohydrates are absorbed, which causes blood sugar to increase. This increase in the blood sugar triggers the release of insulin from the pancreas, which acts to limit the rise of blood sugar and maintain postmeal blood sugar levels in the normal range.
Insulin acts at several sites in the body, predominantly at the tissue level, stimulating glucose uptake by muscles and fat. It also acts at the liver to stimulate glycogen formation and the storage of glucose. These two actions together lead to lower blood sugar. For individuals without diabetes, this is a very precise system which maintains balance between glucose levels below 140 mg/dL.

WHAT IS DIABETES

Diabetes is a condition of high blood sugar or hyperglycemia, that result from either insulin deficiency or impaired insulin action, which is also called insulin resistance. In general, there are two classes of diabetes -Type 1 diabetes, which is due to insulin deficiency. There is genetic susceptibility to autoimmune disease in this. -type 2 diabetes, which is the result of insulin resistance

TYPE 2 DIABETES

Unlike type 1 diabetes, type 2 diabetes does not involve a problem with insulin production. The problem here is with insulin action. These patients often have high insulin levels, but suffer from insulin resistance, meaning the tissues are unable to "SEE" the insulin, resulting in a relative insulin deficiency. Type 2 diabetes is also known as adult onset diabetes, as it tends to present in overweight adults. There is also a genetic component, as it tends to run in families. If one or both parents has type 2 diabetes, children are more than four times as likely to develop type 2 diabetes.

INSULIN RESISTANCE DEVELOPS FIRST

Patient first develops insulin resistance, requiring higher levels of insulin to maintain normal blood sugars. Initially pancreas is able to keep up with insulin production, and insulin levels are elevated. However, with time, pancreas fails and patients are unable to maintain normal blood sugar without medication.

RISK FACTORS FOR TYPE 2 DIABETES

GENETICS: having a first-degree relative with diabetes is one risk factor
ETHNICITY: Type 2 diabetes is more common in certain ethnicities, such as African-Americans, Latinos, Native Americans, South east Asians (INDIAN SUBCONTINENT), Pacific islanders

HISTORY OF GESTATIONAL DIABETES(Diabetes during pregnancy)

Women with the history of gestational diabetes are at higher risk of developing type 2 diabetes
CERTAIN COMORBIDITIES Such as:- Cardiovascular disease Hypertension Hyperlipidemia Conditions associated with insulin resistance or associated with type 2 diabetes. These are.:-polycystic ovarian syndrome, Acanthosis Nigricans in which there is skin darkening on the neck and axilla due to high insulin levels.

OBESITY AND PHYSICAL INACTIVITY

Obesity and physical inactivity increase the risk of developing type 2 diabetes. An elevated BMI is associated with a significant increase in the risk of diabetes. - BMI of 25 kg/m² or more for non-Asian patients - BMI of 23 kg/m2 or more for Asian patients

WHO SHOULD BE SCREENED FOR DIABETES

Most guidelines recommend screening ; - All patience over the age of 35 - All overweight patients - Adults of any age who have risk factors for type 2 diabetes, such as high blood pressure, high cholesterol, or a family history of the disease - Women who have had gestational diabetes(screened every three years) - Patient with HIV

MAKING THE DIAGNOSIS

1. FASTING BLOOD SUGAR LEVELS- Blood sugar level after eight hours of fasting and if this is greater than or equal to 126 mg/dL 2. ORAL GLUCOSE TOLERENCE

TEST- For this, patient is given a beverage containing 75 g of glucose. Then blood sugar is measured two hours after. A reading of greater than 200 mg/dL is diagnostic of diabetes. In both of these cases, the abnormal results must be confirmed on repeat testing. Not all patients have both elevated fasting and elevated postmeal blood sugars. Some may have just high fasting blood sugar, while others may just have high postmeal blood sugars. In these cases, we may miss the diagnosis of diabetes if we use the wrong test. In this situations, using hemoglobin A1c make the diagnosis more easily. 3. HEMOGLOBIN A1c-A level of 6.5% or greater suggests diabetes. This test does not need fasting.

WHAT IS PRE-DIABETES

Pre-diabetes is a condition where- in blood sugar falls between normal and diabetes - If patients have fasting blood sugar between 100 and 126 mg/dL, they have impaired fasting glucose. - If post meal blood sugar is between 140 and 200 mg/dL, they are considered to have impaired glucose tolerance. - Patients with a hemoglobin A1c between 5.6 and 6.5% - Patients with an A1c between 5.5 and 6% have a 10 to 20% risk of developing diabetes over the next five years. - If hemoglobin A1c is between 6 and 6.5%, they have a 25 to 50% risk of developing diabetes.

EARLY INTERVENTION

If pre-diabetes is identified, there are some interventions that have been shown to prevent progression to type 2 diabetes 1. Lifestyle interventions: - A 7% decrease in the body weight, primarily through diet 2. 150 minutes of physical activity weekly, that is at least 30 minutes daily for five days a week. Physical activity is defined as an activity equal in intensity to a brisk walk.

MEDICATIONS

1 METFORMIN: According DIABETES PREVENTION PROGRAM, a medication called metformin helps to improve insulin sensitivity and results in a 30-35% reduction in the incidence of diabetes. For patients with BMI of greater than 35, metformin reduces the risk of development diabetes by 50-60%
ACARBOSE,: This medication blocks the absorption of carbohydrate from the small intestine and it has been shown to decrease the development of diabetes by about 25%. However, this medication is poorly tolerated and has not been used for this purpose.

PIOGLITAZONE (ACTOSE): This medication helps to improve insulin resistance and one study in patient with impaired fasting blood glucose showed a 72% decrease in the development of diabetes. However, significant weight gain can occur with this medication and therefore it has not been used regularly for prevention of diabetes.

GLP-1 RECEPTOR AGONISTS:

These newer drugs used for weight reduction and treatment of diabetes, often can be useful to prevent diabetes. However, these are expensive and are not used routinely for this purpose.
In summary, primary intervention for patients with pre-diabetes should be a lifestyle intervention. Patients should be encouraged to achieve a weight loss of 7% or more. Daily exercise should be encouraged with 30 minutes of activity at least five days a week

For patients at high risk of developing diabetes, those with any of the following characteristics, METFORMIN can be considered. - History of gestational diabetes - Evidence of insulin resistance - Overweight

The above is for information purpose only. As always, make sure you check with your own physician before adapting any of the above information into practice.

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