

Transition from Prediabetes to Diabetes is Preventable

Prediabetes is considered as a stage previous to diagnosis of diabetes mellitus (DM). It is a stage when blood glucose level is higher than the normal range, but it is still not high enough to be considered as diabetes. Prediabetes is an indication that one could develop type 2 diabetes if certain lifestyle changes are not adopted.^[1]

Diabetes can be diagnosed either in fasting state or after food is taken. It is diagnosed when fasting blood glucose is ≥ 126 mg/dL on two separate occasions after 8–10 h of fasting. The fasting is considered normal when it is below 100 mg/dL. Therefore, if one's blood glucose falls within these two conditions (between 100 and 125 mg/dL) it is called impaired fasting glucose (IFG). Similarly, diabetes is also diagnosed when blood glucose is ≥ 200 mg/dL after food intake. For nondiabetic individuals, after food intake blood glucose should not rise beyond 140 mg/dL. Therefore, if one's blood glucose falls within these 2 conditions (between 140 and 199 mg/dL), it is called impaired glucose tolerance (IGT). Because diabetes can be ascertained based on these two blood glucose values the stages preceding diabetic range but exceeding normal range together is coined as prediabetes. Simply stated if one is diagnosed to have IFG or IGT or both then he/she is said to have prediabetes.^[1]

Once diabetes sets in, it brings forth a lot of metabolic changes. However, the good news is that prediabetes is a stage where one can prevent its development into type 2 diabetes. Following a healthy or balanced diet, ensuring weight loss, and maintaining a physically active lifestyle can bring the blood glucose level back into the normal range.

SYMPTOMS OF PREDIABETES

Most of us are educated or aware of symptoms of diabetes. However, development of diabetes is a gradual process. Therefore, when one enters prediabetes stage, despite blood glucose level being higher the normal range, diabetes-associated symptoms may not be present at all. However, one may notice certain features such as:^[1]

- Feeling hungrier than normal or thirstier than normal
- Sensing a loss of weight despite eating more
- Feeling the urge to visit the toilet more frequently
- Feeling fatigued more than usual.

All these are typical symptoms associated with diabetes, and hence, one or more of these symptoms may be perceived in the early stages of diabetes, too.

CAUSES AND RISK FACTORS

Prediabetes develops when the hormone insulin is ineffective to bring glucose level down. Insulin is necessary for glucose transport into the cell and its utilization. Hence, in prediabetes, either insulin production is not adequate enough or not effective enough (beginning of insulin resistance). In either of the conditions, it leads to accumulation of glucose in blood, leading to a higher than normal blood glucose level (above 100 mg/dL in fasting condition and/or above 140 mg/dL after food intake). Therefore, risk factors of type 2 diabetes also act as risk factor for prediabetes^[2] such as:

- **Overweight:** If body mass index (is higher than 23 kg/m² for Asians), there is high risk for developing prediabetes. Especially if it is associated with abdominal obesity, chances are higher. This is because the abdominal fat pours directly into portal circulation adding to inflammation which is facilitating to insulin-resistant state
- **Lack of physical activity:** This often goes hand-in-hand with being overweight. If one is physically less active, leading a sedentary lifestyle, it leads to insulin resistance at skeletal muscles making one prone to develop prediabetes
- **Family history:** Prediabetes has a hereditary factor just as diabetes
- **Age:** With age, the risk of prediabetes increases. At the age of 45 years, your risk starts to rise, and after the age of 65 years, your risk increases exponentially
- **Stress:** Chronic stress is the major risk factor for developing prediabetes and diabetes
- **Race/ethnicity:** Certain ethnic groups are more likely to develop prediabetes, including African-Americans, Hispanic Americans, Native Americans, and Asian Americans
- **Gestational diabetes:** The incidence of diabetes during pregnancy, increases the risk for developing prediabetes later on
- **Other health problems:** High blood pressure (hypertension) and hyperlipidemia especially high cholesterol (the “bad” Low-density lipoprotein cholesterol) increase the risk of getting type 2 diabetes. Therefore, having these traits one can develop prediabetes. Similarly, polycystic ovary syndrome (PCOS) also raises the risk for prediabetes because it is related to insulin resistance. In this disease, multiple cysts are formed in the ovaries. One of the

possible causes is insulin resistance. Therefore, if one has PCOS, that means she is already insulin resistant and therefore at risk for developing prediabetes.^[2]

MANAGEMENT

Prediabetes is a silent killer and is the known risk factor for developing diabetes. Having prediabetes for a longer duration is equally dangerous to that of having diabetes. As stated earlier diagnosis of prediabetes cannot be relied on symptoms as it may go symptomless in many individuals. However, a blood test can easily assess the glucose levels and confirm the diagnosis. One should voluntarily do the blood glucose test if one is overweight or has one or more of the risk factors listed above. As such above the age of 45 one should regularly check blood glucose, blood pressure and body weight.

To diagnose prediabetes, the doctor can advise one of two tests – or do both. The tests are:

- Fasting plasma glucose test (FPG): Before the test day, for at least 8 h one should fast. The next day morning, blood should be drawn for the FPG test. If your blood glucose level is between 100 and 125 mg/dL, it is called prediabetes (IFG). If your blood glucose level is above 126 mg/dL with the FPG test, then one should repeat the test at least with 3 days gap to confirm diabetes
- Oral glucose tolerance test (OGTT): This is another test used to diagnose prediabetes. Fasting for minimum 8 h before the test is advocated. However, one must take normal carbohydrate-rich food for 3 continuous days before to avoid false-negative finding. On the day of the test, one should refrain from smoking (if he/she is a smoker), should be seated comfortably and give fasting blood sample. This should be followed by drinking of 75 g of a very sugary mixture in about 300 mL of water. Two hours later, blood is again drawn for glucose estimation. However, during this 2 h, one should not take any other food or beverages.

If blood glucose level is between 140 and 199 mg/dL 2 h after drinking the sugary mixture, it is diagnosed as IGT which is another stage of prediabetes. If the blood glucose level is above 200 mg/dL with the OGTT, then it is indicative of diabetes.

PREVENTION

The American Diabetes Association (ADA) advocates a serious lifestyle changes for preventing type 2 diabetes after one is diagnosed with prediabetes.^[1] The recommendations are:

- Balanced diet: A registered dietitian or certified diabetes educator can help create a meal plan that's balanced for carbohydrate protein and fat while ensuring that the carbohydrate part is mainly of low glycemic index. This

ensures slow rise in blood glucose level following each meal intake to keep it within normal range. The meal plan is always customized, taking into account one's age, gender, other health problems, physical activity, palatability

- Exercise: During exercise, skeletal muscles consume more glucose, thus lowering blood glucose level. Also when one exercises, body does not need as much insulin to transport the glucose; so body becomes less insulin resistant. Since the body is not using insulin well when you have prediabetes, a lower insulin resistance acts as a preventive measure. Regular exercise also aids in weight loss reducing the overweight associated risk. The ADA recommends at least 150 min of moderate activity a week – that's 30 min 5 days a week. One can get that through activities such as walking, bike riding, swimming, and jogging.
- Weight loss: If you are overweight, you should get started on a weight loss program as soon as you are diagnosed with prediabetes. Losing just 5%–10% of your weight can significantly reduce the risk of developing type 2 diabetes. The combination of balanced diet and exercise is a great way to lose weight
- Metformin: The ADA says that metformin should be the only medication used to prevent from prediabetes to type 2 DM. It works by keeping the liver from making more glucose when you do not need it, thereby keeping your blood glucose level in a better range. Therefore, monitoring the blood glucose level regularly can ensure sure that prediabetes stage does not lead to type 2 diabetes^[2]
- Stress management: One has to learn to reduce the stress level. Stress is the major cause of diabetes, hypertension and heart disease. Relaxation therapy is very useful in relieving stress. Shvasana is quite helpful. Stress management is a must for prevention of developing diabetes.
- Asanas and pranayama: All forward and backward bending asanas that provide mechanical massage to pancreases facilitate pancreatic functions and insulin release. Abdominal breathing and Bhastrika pranayama are useful in this regard. Furthermore, practice of slow pranayamas such as Chandra Nadi pranayama and Anulom-Vilom Pranayam is very useful in promoting vagal activity and thereby facilitating insulin secretion.

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