

## Diabetes Mellitus – 1. The Big Picture.

This post is the first in a series of articles that discusses the topic of diabetes mellitus, more commonly known simply as “diabetes.” We have an ambitious agenda for this series. We will cover all of the important aspects of this family of disorders including the definitions of the various types of diabetes, the multiple underlying causes, the specific populations at increased risk for developing diabetes, and the numerous options for treatment. Most important, since the prevalence of diabetes is rising so rapidly, we will discuss strategies for prevention. Indeed, people who are at risk of developing the most common form of diabetes can often avoid the disease by making informed lifestyle choices. In fact, many cases of established diabetes can be reversed (at least in part) by using the same lifestyle strategies.

We start by discussing exactly what diabetes is. The term “diabetes” refers to 12 types of disorders (and multiple sub-types) that share one thing in common – disturbances of body chemistry that lead to elevated blood sugar levels. The diagnosis of diabetes is based on the blood concentration of the most important sugar, glucose. When the blood glucose concentration is greater than 125 mg/dL after a fast of at least 8 hours, or greater than 199 mg/dL after eating, the diagnosis of diabetes is made. But there is a critical point that is often lost in the conversation – when people develop diabetes, in addition to glucose, the concentrations of numerous other chemicals in the bloodstream also become abnormal. In many cases, it is these other chemicals, not just the glucose, that lead to tissue damage, organ malfunction, and eventually death. Indeed, diabetes can be considered a form of chronic internal chemical poisoning, resulting from both the accumulation of toxic chemicals and the depletion of beneficial chemicals. It is this toxic metabolic environment and the resulting system-wide tissue damage that makes diabetes so dangerous. These metabolic toxins damage microscopic blood vessels as well as large arteries, they damage nerve fibers, they damage the eyes, they interfere with the function of critical organs like the liver and kidneys – they adversely affect the structure and function of our bodies from head to toe.

On average, the degree of blood glucose elevation is correlated with the severity of diabetes. However, since the elevated glucose concentration is only one of multiple potential chemical disturbances in a diabetic patient, there is substantial variability from patient to patient in the severity of disease for any given degree of glucose elevation. Some patients can have elevated blood glucose concentrations and yet still enjoy good health. Despite their high blood glucose concentrations, their blood chemistry is otherwise reasonably normal. These individuals also may be protected by favorable genetic factors. In contrast, other patients may have only modestly elevated blood glucose concentrations and yet suffer from a multitude of medical problems. This is because in addition to abnormal blood glucose levels, these individuals suffer from a more complex metabolic disturbance that may involve numerous chemical toxins arising from within. Genetic factors may also increase their vulnerability to these toxins.

Differences in disease severity for similarly elevated glucose levels relates to the underlying causes of the metabolic disturbances. Let’s consider some specific examples. Type 1A diabetes occurs when the immune system causes isolated destruction of cells in the pancreas gland that make the insulin hormone (beta cells). Patients with this disorder can lead long and healthy lives by following healthy lifestyle practices and taking carefully regulated supplements of insulin. In contrast, Type 2 diabetes is caused by the release of multiple metabolic toxins from fatty tissue accumulating in the abdomen. These toxins destroy the beta cells as well as numerous other tissues throughout the body, leading to high blood pressure, atherosclerosis, heart attacks, heart failure, kidney disease, fatty liver disease, liver cirrhosis, and multiple forms of cancer. Therefore, Type 2 diabetes is a more complex metabolic situation and usually requires management with multiple medications (not just insulin) as well as healthy lifestyle practices.

In addition to lifestyle, genetic and ethnic factors are very important determinants of the risk for developing diabetes and of disease severity. Knowledge of one’s diabetes risk is extremely important. We will discuss diabetes risk factors, including lifestyle, ethnic, and genetic factors in my next post.