

Type 2 Diabetes

Over the past thirty years, rates of type 2 diabetes throughout the developed world have risen dramatically, in tandem with the increased prevalence of obesity. With more than a ten-fold surge in diagnoses since 1985 and a host of complications that reduce life expectancy by an average of ten years, type 2 diabetes has become a major health concern.¹ Unlike type 1 diabetes, which occurs when beta cells in the pancreas destroy insulin and prevent its production, type 2 diabetes is characterized by insulin resistance, a relative lack of insulin, and persistently high blood sugar.² The precise cause of type 2 diabetes is unknown but genetics and lifestyle clearly play a role in its development. Fortunately, while type 2 diabetes is a costly and burdensome disease, eating healthy foods, exercising regularly, and avoiding tobacco can help prevent onset as well as mitigate effects and significantly improve quality of life for patients.³

Diabetes is now recognized as an epidemic by the World Health organization, with an estimated 392 million cases of type 2 diabetes—90% of all diabetes incidents—around the world in 2015.⁴ The United States currently leads the developed world with an estimated 30 million cases of type 2 diabetes.⁵ Because the disease is undiagnosed in up to 25% of patients, estimates are made regularly to capture the true scope of the illness. Type 2 diabetes is more prevalent among African American, Hispanic/Latino, Pacific Islander, Asian American, and American Indian populations.⁶ There is some speculation that certain ethnic groups are more sensitive to the Western diet, which could explain disease disparities among different ethnicities.⁷ Women are also somewhat more at risk for developing type 2 diabetes, particularly if they experienced gestational diabetes during pregnancy. For many years, type 2 diabetes was referred to as “adult onset” but this practice has waned as increased childhood obesity rates throughout the developed world have led to more diagnoses in children. Nevertheless, the disease remains far more prevalent among adults, with higher rates in those above the age of 45.⁸

Physiologically, type 2 diabetes involves both insulin resistance and insufficient production of insulin. Resistance to insulin occurs primarily in the liver, muscles, and fat tissue.⁹ Instead of converting glucose to glycogen as it should, the liver of a type 2 diabetic allows excess glucose to be released into the

bloodstream, depriving the body of an important store of energy. Muscles also lose access to critical energy supplies with insulin resistance and fat cells resort to breaking down triglycerides for energy.¹⁰ Insufficient production of insulin by beta cells in the pancreas also occurs with type 2 diabetes, especially as the disease progresses. Although both insulin resistance and impaired secretion are necessary for diagnosis of type 2 diabetes, patients experience these in varying proportions and degrees, which may change over time. Other physiological mechanisms potentially linked to type 2 diabetes include high glucagon levels in the blood, resistance to the hormone incretin that regulates insulin¹¹, and failure of the central nervous system to properly regulate metabolism.

Symptoms of type 2 diabetes include increased thirst and urination, increased hunger, unexplained weight loss, and fatigue. Blurred vision, tingling in hands or feet, and sores that do not heal properly may also be present.¹² Unfortunately, many people do not even realize they have developed type 2 diabetes until several years after onset of the disease, which means that treatment may not begin until complications have already arisen.¹³ Type 2 diabetes is a progressive disease, with both insulin resistance and production worsening over time.¹⁴ As the body's glucose is controlled less and less, a number of serious complications develop, including up to a four-fold increase in cardiovascular disease, kidney failure, lower limb amputation, and blindness.¹⁵ Mortality rates from type 2 diabetes are difficult to assess, perhaps because the primary cause of death is often myocardial infarction or kidney failure, but death rates have declined in recent years due to increased treatment and education. While the death rate from type 2 diabetes is significantly lower than from type 1, it remains concerning, especially among patients below the age of 55 who are twice as likely to die young than their healthy peers.¹⁶

As a slow-developing, progressive disease, type 2 diabetes may be undiagnosed for years in patients with minimal symptoms. Several blood tests can be used for diagnosis, including a fasting plasma glucose test that can pinpoint glucose level at a certain point in time (this is usually conducted in the morning, as it requires an 8 hour fast), the A1C test which measures average levels of blood glucose levels over three months, and a random plasma glucose test which may be more convenient but is also less accurate.¹⁷ A diagnosis of diabetes usually requires two tests to confirm consistently elevated blood sugar. Some patients whose blood sugar is high but does not meet the standards for type 2 diabetes are diagnosed with "prediabetes," a sign that diabetes is likely to develop unless changes are made in diet, exercise, and/or tobacco use.¹⁸ Absent symptoms of the disease, screening for diabetes does not typically take place during regular physical exams. However, doctors may decide to conduct diabetes

testing based on results of standard blood or urine tests or based on the presence of certain risk factors such as age, ethnicity, genetic predisposition, or obesity.

The treatment of type 2 diabetes ideally begins with lifestyle changes including quitting tobacco and losing weight through improved nutrition and increased activity. Changing diet and increasing exercise not only lowers blood sugar but can also increase the effectiveness of insulin.¹⁹ While there is debate about the “best” diet for type 2 diabetics, some evidence suggests that a low carbohydrate diet can be effective in reducing blood sugar levels. Limiting intake of sugar-sweetened beverages and foods high in trans or saturated fats may also be helpful in controlling blood sugar as well as lowering BMI.²⁰ Fortunately, these lifestyle changes have the added benefit of reducing complications such as cardiovascular disease. Some patients who make significant advances in adopting a healthier lifestyle see blood glucose levels return to normal and no longer experience symptoms of type 2 diabetes. However, the disease is not considered reversed or cured because any backsliding on lifestyle improvements--resuming tobacco use, gaining weight, giving up on exercise, or returning to a poor diet--can cause symptoms to re-emerge. Bariatric surgery is also successfully used to treat type 2 diabetes in cases of obesity and uncontrolled blood glucose levels, both because it reduces a patient's BMI and causes positive hormonal changes in the digestive system.²¹ While this is considered an effective treatment, it is also not a cure because diabetic symptoms can be expected to return if a patient regains a significant amount of weight.

The second line of treatment for type 2 diabetes, medication, is used when lifestyle changes alone cannot effectively manage blood sugar levels. Metformin and sulfonylureas are the most common antidiabetic drugs. Some patients may be treated with injectable insulin or incretin mimetics, which mimics the hormone incretin and leads to the secretion of insulin.²² In addition, patients who have developed diabetic complications such as high blood pressure will need medications to treat these specific conditions. Regardless of which treatment approach is best for an individual, education is a key component in diabetes care. While patients with lower glucose levels may not need to self-monitor their blood or urine, all type 2 diabetics must learn to manage their blood sugar and understand how dietary choices and exercise affect their health through the course of each day.

Although a diagnosis of type 2 diabetes can be overwhelming and prevalence statistics are daunting, there is much hope in the realm of diabetes prevention. Significant, sustained lifestyle interventions can reduce the risk of developing type 2 diabetes by more than 50% and exercise is highly beneficial to

diabetic patients regardless of how much weight they are able to lose.²³ There is still debate about whether type 2 diabetes can be prevented entirely among patients with high risk for the disease, however, evidence indicates that both exercise and a healthy diet can delay onset by several years and significantly improve outcomes.²⁴ From a public health perspective much can be done to reduce growing rates of type 2 diabetes through policy initiatives that support a healthy lifestyle (such as bike lanes and fruit and veggie distribution programs) and educational efforts that promote an understanding of the body's nutritional needs (this includes everything from health classes in elementary school to cooking classes for adults). The great news is that approaches to preventing type 2 diabetes involve lifestyle changes that reduce the risk of many diseases, so investing in diabetes prevention offers hope of improving health more broadly.

Although it may be easy to dismiss type 2 diabetes as an indulgent, first-world disease fueled by our love of fries and super-sized soda, it is important to recognize that, uncontrolled, diabetes can have a devastating effect on quality of life as complications multiply and can significantly shorten lifespan. We may consider diabetes “modern,” but it was among the first recorded diseases and was noted in an Egyptian manuscript from 1500 BCE (the two distinct types of diabetes were first noted around 400 AD).²⁵ The presence of diabetes throughout history is a powerful reminder that the disease will not disappear soon—to reduce the very real suffering diabetes causes, a significant effort must be made to prevent type 2 diabetes, especially among those populations most at risk of developing the disease.

WORKS CITED

1. "Diabetes Mellitus Type II." *Wikipedia*. Wikimedia Foundation, 11 July 2017. Web. 16 July 2017.
2. "Differences Between Type 1 and Type 2 Diabetes." *Diabetes Research Connection*. Diabetes Research Connection, 04 Nov. 2016. Web. 16 July 2017.
3. "Diabetes Mellitus Type II." *Wikipedia*. Wikimedia Foundation, 11 July 2017. Web. 16 July 2017.
4. Ibid, Wikipedia.
5. "U.S. Leads Developed Nations in Diabetes Prevalence." *Endocrine News*. Endocrine Society, 01 Dec. 2015. Web. 16 July 2017.
6. "Risk Factors for Type 2 Diabetes." *National Institute of Diabetes and Digestive and Kidney Diseases*. U.S. Department of Health and Human Services, 01 Nov. 2016. Web. 16 July 2017.
7. "Diabetes Mellitus Type II." *Wikipedia*. Wikimedia Foundation, 11 July 2017. Web. 16 July 2017.
8. "Risk Factors for Type 2 Diabetes." *National Institute of Diabetes and Digestive and Kidney Diseases*. U.S. Department of Health and Human Services, 01 Nov. 2016. Web. 16 July 2017.
9. "Diabetes Mellitus Type II." *Wikipedia*. Wikimedia Foundation, 11 July 2017. Web. 16 July 2017.
10. Mandal, MD Dr Ananya. "Diabetes Mellitus Type 2 Pathophysiology." *News-Medical.net*. News Medical Life Sciences, 17 Nov. 2013. Web. 16 July 2017.
11. Kim, Wook, and Josephine M. Egan. "Home - PMC - NCBI." *National Center for Biotechnology Information*. U.S. National Library of Medicine, 12 Dec. 2008. Web. 16 July 2017.
12. "Diabetes Mellitus Type II." *Wikipedia*. Wikimedia Foundation, 11 July 2017. Web. 16 July 2017.
13. "What Is Diabetes?" *National Institute of Diabetes and Digestive and Kidney Diseases*. U.S. Department of Health and Human Services, 01 Nov. 2016. Web. 16 July 2017.
14. Fonseca, Vivian A. "National Center for Biotechnology Information." *National Center for Biotechnology Information*. U.S. National Library of Medicine, n.d. Web. 16 July 2017.
15. "Diabetes Mellitus Type II." *Wikipedia*. Wikimedia Foundation, 11 July 2017. Web. 16 July 2017.
16. Tancredi, Mauro. "Excess Mortality among Persons with Type 2 Diabetes — NEJM." *New England Journal of Medicine*. NEJM Group, n.d. Web. 16 July 2017.
17. "Diabetes Tests & Diagnosis." *National Institute of Diabetes and Digestive and Kidney Diseases*. U.S. Department of Health and Human Services, 01 Nov. 2016. Web. 16 July 2017.

18. "Diagnosing Diabetes and Learning About Prediabetes." *American Diabetes Association*. American Diabetes Association, 9 Dec. 2014. Web. 16 July 2017.
19. "Type 2 Diabetes: Overview." *National Center for Biotechnology Information*. U.S. National Library of Medicine, 04 June 2014. Web. 16 July 2017.
20. "Diabetes Mellitus Type II." *Wikipedia*. Wikimedia Foundation, 11 July 2017. Web. 16 July 2017.
21. Roach, Paris, MD. "Is Type 2 Diabetes Reversible?" *Diabetes Forecast*. American Diabetes Association, Nov. 2016. Web. 16 July 2017.
22. "Type 2 Diabetes: Overview." *National Center for Biotechnology Information*. U.S. National Library of Medicine, 04 June 2014. Web. 16 July 2017.
23. "Diabetes Mellitus Type II." *Wikipedia*. Wikimedia Foundation, 11 July 2017. Web. 16 July 2017.
24. "Type 2 Diabetes: Overview." *National Center for Biotechnology Information*. U.S. National Library of Medicine, 04 June 2014. Web. 16 July 2017.
25. "Diabetes Mellitus Type II." *Wikipedia*. Wikimedia Foundation, 11 July 2017. Web. 16 July 2017.