

# Diabetes mellitus: Risk Factors Contributing to Type 2 Diabetes

## Abstract

In addition to other risk factors like obesity and a sedentary lifestyle, type 2 diabetes is a serious and prevalent chronic disease caused by a complex interaction between genes and environment. Nearly all populations in both developed and developing nations are affected by type 2 diabetes and its complications, which contribute to high rates of diabetes-related morbidity and mortality. Type 2 diabetes is on the rise at an exponential rate, and a high prevalence rate has been observed in populations undergoing “westernization” or “modernization” as well as in developing nations. It is necessary to develop new effective therapy strategies and appropriate preventative measures for the control of type 2 diabetes due to the numerous risk factors of the disease, the delay in diagnosis until micro- and macro-vascular complications arise, life-threatening complications, the failure of the current therapies, and the financial costs associated with the treatment of this disease. We present a synopsis of what we know so far about the epidemiology of type 2 diabetes, including the roles that genes, lifestyle, and other factors play in the rapid rise in the disease’s prevalence. The primary objectives are to advance new type 2 diabetes therapy strategies and cost-effective intervention trials.

The prevalence of diabetes mellitus in various regions is examined. Adult diabetes prevalence is highest in the Middle East and North Africa region (10.9%), while the Western Pacific region has the highest number of adults diagnosed with diabetes and the countries with the highest diabetes prevalence (37.5%). Diagnostic criteria, etiology, and genetics are compared between various classes of diabetes mellitus, including gestational diabetes, type 1, and others. Numerous prominent biomedical researchers have paid a lot of attention to the diabetes molecular genetics issue in recent years. A review of a large number of mutations and single nucleotide polymorphisms in genes that are involved in the various stages and pathways of glucose metabolism, as well as the development, control, and function of pancreatic cells at various levels, is provided.

**Keywords:** Chronic disease • Environment interaction • Diabetes mellitus • Gestational diabetes • Macro-vascular complications arise • Classification of diabetes • Type 1 diabetes • Type 2 diabetes • Gestational diabetes • Diagnosis • Etiology • Genetics

## Introduction

Chronic hyperglycaemia and impaired metabolism of carbohydrates, lipids, and proteins are hallmarks of diabetes mellitus, which is caused by either complete or partial insufficiency of insulin secretion and/or action. Insulin-dependent diabetes mellitus and non-insulin-dependent diabetes mellitus are the two most common types of diabetes [1]. The most common type of diabetes, T2DM, is expected to reach 439 million people by 2030. It affects 90 to 95 percent of diabetics. According to the most recent statistical data, the prevalence of diabetes and pre-diabetes in Chinese adults over the age of 20 is 9.7 percent for T1DM and 15.5% for T2DM, respectively. The majority of T2DM cases are the result of interactions between genetic, environmental, and other risk factors. T2DM is also accelerated by the loss of the first phase of insulin release, abnormal plasticity of basal insulin secretion, and increased glucagon secretion. Although T2DM patients typically do not require exogenous insulin, they may require it if diet alone or oral hypoglycaemic medications are not effective in controlling their blood glucose levels [2]. Additionally, complications like cardiovascular disease, diabetic neuropathy, nephropathy, and retinopathy frequently accompany T2DM patients. Diabetes and its complications have a negative impact on people’s quality of life and impose enormous financial and social costs. Diabetes mellitus is becoming an epidemic at an alarming rate. Using the recommended hemoglobin A1C criteria, diabetes and prediabetes must be diagnosed early for all types, with the exception of gestational diabetes. Diabetes screening is absolutely necessary to cut down on missed diagnoses, especially in

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developing nations. Genetic and non-genetic factors interact during the development of diabetes. Biomedical research continues to shed new light on the mechanism of diabetes development that is discussed in this article. Several genes could be used as targets for risk assessment, therapeutic strategies, and complications prediction thanks to recent research [3].

### Diabetes mellitus and epidemiology

Chronic hyperglycaemia is the hallmark of diabetes mellitus, a group of metabolic conditions caused by malfunctions in insulin secretion, insulin action, or both. The role that insulin plays as an anabolic hormone causes metabolic abnormalities in proteins, lipids, and carbohydrates. At the level of insulin receptors, the signal transduction system, and/or effector enzymes or genes, these metabolic abnormalities are responsible for low levels of insulin to achieve adequate response and/or insulin resistance in target tissues, primarily skeletal muscles, adipose tissue, and to a lesser extent, liver [4]. The type and duration of diabetes are to blame for the severity of symptoms. Some diabetics, particularly those with type 2 diabetes in the early stages of the disease, are asymptomatic, while others exhibit polyuria, polydipsia, polyphagia, weight loss, and blurred vision in children with absolute insulin deficiency. Due to ketoacidosis or rare from nonketotic hyperosmolar syndrome, uncontrolled diabetes can result in stupor, coma, and death if not treated [5].

T2DM is now recognized as a global public health issue. Recent statistical data reveal a number of novel epidemiological characteristics for T2DM. First, the prevalence of diabetes continues to rise in developed nations like the United States and Japan. It is also important to note that T2DM is becoming a serious problem in developing nations at an alarming rate. In the next twenty years, it is anticipated that T2DM will continue to rise, with over 70% of patients appearing in developing nations, most of who are between 45 and 64 years old [7]. India, China, Russia, Brazil, Pakistan, Indonesia, and Bangladesh are among the low- or middle-income nations that have the highest prevalence rates of diabetes patients today, with 12.1% and 9.7%, respectively, in India and China [6]. Second, although age is a risk factor for T2DM, rising

rates of childhood obesity have led to an increase in the prevalence of T2DM among children, adolescents, and young adults. This is a serious resurgence of the epidemic and a significant new public health issue [7].

### Type 2 Diabetes and vitamin D

As seasonal variation in T2DM patients' glycaemic status is found, and hypovitaminosis D frequently occurring in the winter is likely to be associated with the aggravation of T2DM, there is mounting evidence that vitamin D may play a role in the control of T2DM. Vitamin D deficiency may have negative effects on glucose intolerance, insulin secretion, and type 2 diabetes either directly through activation of the vitamin D receptor or indirectly through calcemic hormones and inflammation [8]. Because pancreatic cells contain both 1-hydroxylase and VDR, vitamin D plays a significant role in the synthesis and release of insulin [6]. Additionally, vitamin D regulates calcium flux through the membrane in both cells and peripheral insulin-target tissues, influencing insulin sensitivity [9]. In addition, vitamin D supplementation is recognized as a promising and cost-effective treatment that has the potential to lower T2DM risk and improve glycaemic control in T2DM patients. As a result, it would appear that vitamin D's positive effects on inflammation and insulin sensitivity are linked to its positive effects on insulin secretion [10].

### Conclusions

Worldwide, T2DM and the complications that go along with it cause significant health problems, and there aren't enough effective treatments for the diseases. The interaction of genetic and environmental risk is the main factor contributing to the diabetes epidemic. The diseases are also caused by a number of other things. Although the majority of antidiabetic medications have been shown to be beneficial when administered as immunotherapy or as part of a combination therapy, they can also cause side effects like weight gain, hypoglycaemia, gastrointestinal problems, or cardiovascular disease. One of the top priorities in the fight against T2DM has become finding the ideal treatment because of the disease's rising prevalence. SGLT2 inhibitors, DPP-4 inhibitors, and GPR40 agonists are just a few of the therapeutic strategies that have been developed thus far.

Most importantly, stem cell educator therapy made it possible to develop novel, safe, and highly effective treatment options for T2DM.

Diabetes mellitus is the century-long pandemic, and unless effective early diagnostic methods are developed, the disease will continue to spread. This review focuses on the various types of diabetes as well as the most reliable diagnostic methods and criteria for diabetes and prediabetes. It is evident that diabetes is a complicated condition that is influenced by a large number of genes. An essential tool for improving diagnosis, treatment (more geared toward individualized patient-targeted therapy), and more efficient genetic counselling may be provided by the precise identification of diabetes's genetic bases. In addition, our advanced understanding of the connection between diabetes's chronic complications and medical genetics will make it easier to prevent or delay these complications, which have a significant impact on patient quality of life and significantly raise healthcare costs.

The precise mechanism that leads to T2DM and the complications that come with it should be the primary focus of any subsequent research; effective trials of interventions and measures to prevent this disease from happening; earlier diagnosis to begin treatment earlier; new drugs that have fewer side effects and more benefits, with the goal of curing this disease and extending lives in general.

### Acknowledgement

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### Conflict of Interest

None

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