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Diabetes and Hypertension

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Abstract

Diabetes mellitus and hypertension are two of the most prevalent diseases affecting individuals across all age groups. Both conditions are linked to an increased risk of heart disease, peripheral vascular disease, stroke, retinopathy, and neuropathy. The study highlights that diabetes damages arteries and blood vessels, elevating the risk of heart attack and kidney failure. The coexistence of diabetes and hypertension exacerbates these complications, underscoring the importance of managing both conditions simultaneously. The study also focuses on Metformin, a well-established medication for treating type 2 diabetes. Recognized as one of the most effective treatment options, Metformin enhances blood glucose management by increasing insulin sensitivity, reducing insulin levels, and improving insulin action. This makes it a crucial drug for controlling diabetes efficiently and effectively. Furthermore, the findings indicate that diabetes predominantly affects individuals in low- and middle-income countries, contributing to higher mortality rates. The analysis of peer-reviewed journals and articles suggests that diabetes is a chronic disease with severe implications if preventive measures are not promptly implemented. Immediate action is necessary to mitigate the impact of diabetes and improve global health outcomes.

Keywords

Diabetes, Metformin, Hypertension, Blood Glucose Levels, Insulin, Blood Pressure

1. Introduction

Diabetes, a condition characterized by elevated blood glucose levels, poses significant health risks and is a growing global concern. Excess glucose in the blood can lead to severe health problems, including heart disease, eye issues, and kidney disease [1]. Diabetes mellitus, commonly referred to as diabetes, occurs when the pancreas fails to produce enough insulin to regulate blood sugar levels [2]. This

condition is more prevalent than diabetes insipidus and includes two main types: Type 1 and Type 2 diabetes, both chronic diseases [3] [4]. In contrast, diabetes insipidus is a rare condition where the kidneys produce excessive urine, leading to significant fluid loss [3]. This condition is not related to blood glucose levels but rather to the body's ability to manage water balance.

Diabetes is a significant cause of death among adults worldwide. In 2017, diabetes was responsible for four million deaths globally. The economic burden is substantial, with global health expenditure on diabetes estimated at $727 billion. The International Diabetes Federation (IDF) reports that in 2021, 537 million adults were living with diabetes, a number expected to rise to 783 million by 2045 [5] [6]. Diabetes is a global challenge that affects individuals' health and well-being and imposes substantial medical expenses on families. Obesity is a major risk factor for diabetes, with a higher prevalence observed in economically developing countries [7]. Type 1 diabetes is more common in high-income countries, whereas Type 2 diabetes is prevalent globally and contributes significantly to higher mortality rates [8] [9]. Diabetes can lead to severe complications, including microvascular diseases such as retinopathy, nephropathy, and neuropathy, as well as macrovascular diseases like cardiovascular, cerebrovascular, and peripheral vascular diseases [2]. Chronic hyperglycemia primarily drives these complications, resulting from deficiencies in insulin production or action [10].

2. Classification of Diabetes Based on Clusters

Cluster analysis is based on age at diagnosis, body mass index (BMI), waist circumference, HbA1c, serum triglycerides, serum HDL cholesterol and C-peptide fasting, and stimulation of the C-peptides are some of the factors of clusters of patients with type 2 diabetes. The classification of diabetes based on clusters is as follows.

2.1. Cluster One

Cluster 1 is called severe insulin deficiency diabetes, represented by the lowest body mass index, levels of c-peptides, and waist circumference. Patients diagnosed with cluster 1 diabetes also have lower levels of HOMA-B and HOMA-IR, and HbA1c values are significantly higher. Therefore, insulin is the wiser option for the patients in cluster 1 to manage the situation as it helps control blood sugar levels [11].

2.2. Cluster Two

Cluster 2, known as insulin-resistant obesity (IROD), is characterized by a higher body mass index and waist circumference. It also has the highest C-peptide level and elevated HOMA-B and HOMA-IR levels. Due to these adverse conditions, it is managed with Metformin. Tanabe, Masuzaki, and Shimabukuro [12] state that metabolic controls are regulated with the correct dosage of Metformin.

2.3. Cluster Three

Cluster 3 diabetes, known as combined insulin-resistant and deficient diabetes

(CIRDD), is characterized by an earlier onset of diabetes. Unlike clusters 1 and 2, this group has an intermediate body mass index and waist circumference. It also has low HDL cholesterol levels and the highest triglyceride levels. Similar to clusters 1 and 2, this cluster has the highest C-peptide level. The HOMA-B and HOMA-IR values are intermediate compared to clusters 1 and 2. Tanabe et al. [13] suggest that insulin deficiency and resistance coexist in this group. The metabolism in this group is lower than 15%, and patients are highly dependent on insulin.

2.4. Cluster Four

Cluster 4, known as mild age-related diabetes, is notably found in the older age group. It is characterized by the highest HDL cholesterol level and preserved C-peptide levels. A notable feature of this cluster is its robust metabolic control compared to the other clusters. Additionally, the use of insulin by patients is significantly lower in this age group [14].

3. Diabetes Mellitus

3.1. Symptoms of Diabetes Mellitus

Diabetes mellitus is a multisystemic disease with the potential to cause significant organ failure through various mechanisms. According to the American Diabetes Association, vascular disease is the leading cause of incidence and death among diabetic individuals [15]. Although epithelial cells are glycolytic, high blood glucose levels can divert extra glucose into other pathways, such as the polyol pathway or the nonenzymatic synthesis of advanced glycated end-products (AGEs). Several researchers suggest chronic damage is the fundamental cause of vascular disease onset. In hyperglycemia, the production of reactive oxygen species (ROS) in mitochondria increases, which is thought to be the primary cause of endothelial dysfunction and vascular disease. Additionally, the reduction or absence of endothelium-dependent vasodilation (EDV) or the presence of indicators such as sICAM-1 and sVCAM-1 are believed to be early signs of cardiovascular issues [16].

Symptoms of diabetes mellitus include increased thirst, frequent urination, excessive appetite, fatigue, weight loss, and blurred vision [1] [2]. Type 1 diabetes can occur at any age but is often diagnosed in childhood or adolescence [3]. In contrast, Type 2 diabetes is more common among older adults, though it is increasingly being diagnosed in younger populations due to rising obesity rates [17]-[19].

Diabetes mellitus is characterized by insufficient insulin production, leading to elevated blood glucose levels. This condition manifests through increased thirst, frequent urination, weight loss, fatigue, and weakness. The economic burden of diabetes is significant due to the high cost of treatment, and it also imposes social restrictions on individuals, affecting their quality of life. Managing diabetes effectively requires dietary modifications, including healthy, low-carbohydrate diets

and reducing saturated fats and processed foods [20] [21]. Regular monitoring of blood sugar levels is essential to prevent complications and maintain a healthy, fulfilling life.

3.2. Pathogenesis of Diabetes

The alpha cells in the human body, located in the islets of Langerhans, produce the hormone glucagon, which helps regulate blood sugar levels. The pancreas is crucial in lowering blood glucose levels by producing insulin. However, in individuals with diabetes, the immune system attacks the beta cells that produce insulin, leading to elevated blood glucose levels. As these beta cells are destroyed, the pancreas fails to produce sufficient insulin [22]. This autoimmune response significantly impacts the body, causing a rise in blood sugar levels and leading to various forms of diabetes, including type 1 diabetes, type 2 diabetes, and gestational diabetes. Managing these conditions requires careful monitoring and regulation of blood sugar levels to prevent complications.

4. The Role of Blood Glucose

Glucose is the energy source of individual cells responsible for binding various muscles and other tissues in the body [23] [24]. Glucose generally comes from food and the liver; therefore, it is absorbed into the bloodstream. With the help of this bloodstream, it enters the cells [25]. The liver is responsible for storing the sugar converted into glucose. Therefore, when the glucose level is low, the liver breaks down glycogen into glucose to maintain the glucose level at the optimal level [26].

Elevated blood glucose levels, a condition known as hyperglycemia, lead to diabetes mellitus [26] [27]. Hyperglycemia occurs when the body cannot effectively transport sugar from the blood into the cells, resulting in high blood sugar levels [28]. Managing this condition is crucial to prevent the complications associated with diabetes.

Glucose is deposited within cells and later utilized for energy production [29]. When someone has type 2 diabetes, the fat, liver, and muscle cells do not react to insulin as they should. Insulin deficiency is used to describe this [30]. Consequently, blood sugar does not reach these cells, which could be used as energy storage. When blood glucose rises in the bloodstream, blood glucose levels increase in diabetes [31]. Organs, nerves, and blood vessels are damaged over the long term. People with diabetes have blood sugar rises due to their inability to utilize insulin properly [32]. Type 2 diabetes occurs when the pancreas produces insulin, but cells do not react as they should. Insulin resistance is the term used to describe this condition. High blood sugar levels occur when the body either cannot produce insulin, as seen in type 1 diabetes or cannot respond appropriately to insulin, as seen in type 2 diabetes. Insulin is essential for allowing glucose in the blood to enter the body's cells, where it is used for energy production [33]. When this process is disrupted, glucose remains in the bloodstream, leading to elevated

blood sugar levels.

Hypertension significantly increases the risk of developing type 2 diabetes, and conversely, type 2 diabetes also raises the risk of hypertension [34]. The coexistence of these conditions can lead to severe complications, such as stroke, heart attack, and issues related to the eyes and blood vessels. Factors that can elevate the risk of hypertension include high sodium and fat intake, excessive alcohol consumption, and chronic diseases like kidney disease, sleep apnea, and arthritis.

Maintaining a healthy lifestyle from an early age is crucial to reducing the risk of type 1 and type 2 diabetes, as well as hypertension [35]. Studies indicate that people with diabetes can lower their risk of high blood pressure and cardiovascular diseases by managing their blood sugar levels effectively. The pathophysiology of hypertension in diabetes involves complex interactions between the nervous and immune systems, leading to maladaptive changes [36]. Hypertension activates the renin-angiotensin-aldosterone system (RAAS) and is influenced by various environmental factors. Key elements in the development of hypertension include lifestyle factors (such as excessive calorie intake), high intravascular volume, autonomic nervous system dysregulation, and renal dysfunction.

Hypertension and diabetes significantly increase the risk of atherosclerosis and its consequences, such as heart attack and stroke. Substantial overlap exists in the etiology and pathophysiology of these conditions, reflecting their shared genesis and disease processes. Diabetes and hypertension are often detected together more frequently than would occur by chance, with the overlap between dysglycemia and elevated blood pressure being even more significant than that between diabetes and hypertension alone. Genetic or environmental factors are likely shared in the etiology of these diseases [37].

Obesity is a major risk factor for both hypertension and diabetes, representing a global public health challenge. Studies in Western countries have highlighted the concept of health risk grouping and the pathophysiological links between hypertension, obesity, and diabetes. Obesity often results from dysfunctions in brain centers regulating hunger, energy imbalance, and genetic differences. Both diabetes and hypertension are associated with ongoing low-grade inflammatory activity. Chronic periodontitis also increases the risk of developing diabetes, hypertension, cardiovascular diseases, and metabolic syndrome [38].

Diabetes and high blood pressure could be considered chronic inflammatory disorders; however, this is debatable. Insulin plays a crucial role in the development of hypertension, diabetes, and metabolic syndrome. Insulin's primary metabolism accelerates glucose absorption in skeletal muscle and the heart, decreases glucose formation, and reduces lipoprotein (VLDL) in the liver. Insulin secretion is reduced during fasting, resulting in more remarkable glucose synthesis in the liver and kidneys (gluconeogenesis) and increased conversion of glycogen to glucose in the liver (glycogenolysis). Food intake causes insulin release from the pancreas, blocking gluconeogenesis and glycogen synthesis. When insulin is administered, it activates the sympathetic nervous system (SNS), increasing cardiac

output and glucose supply and use in the peripheral tissues. Among insulin's other metabolic actions is the prevention of glucose excretion from the liver, regulating adipose tissue release of free fatty acids (FFA), and accelerating the mechanism by which amino acids are integrated into protein [39].

5. Diagnosis

Diabetes is generally diagnosed with the help of a glycated hemoglobin (A1C) test. This test demonstrates the estimated average blood sugar level for the last three months. For example, below 5% - 7% is considered normal, 5.7% to 6.4% is treated as prediabetes, and higher than 6.5% implies diabetes. On the other hand, if the following AIC test is unavailable, various other tests are implemented to diagnose diabetes, including lumps of blood sugar and oral glucose tolerance tests. In addition, after implementing the diagnosis, medical professionals offer various diabetic medications and exercises to monitor blood sugar levels [38].

Patients who appear with symptoms associated with hyperglycemia and who have a plasma glucose value of 200 mg/dL (11.1 mmol/L) or greater and have this value verified at some other time are likely to have diabetes mellitus, according to the American Diabetes Association. When a patient has fasted for at least eight hours and then drinks a glucose-containing beverage, an oral glucose tolerance test (OGTT) is performed to assess blood glucose levels in the bloodstream [39]. This examination would diagnose diabetes and prediabetes in those who do not. Because it is easy to use and inexpensive, the FPG test is the primary method for identifying diabetic complications. However, it may miss some cases of diabetes or prediabetes that OGTT can detect.

Furthermore, the FPG test is most accurate when performed first thing in the morning. According to research, the OGTT has been more sensitive than the FPG test to diagnose prediabetes but is less practical than the FPG test [40]. A random plasma glucose test measures blood glucose levels without considering when the patient last consumed food. In conjunction with a sign evaluation, this test is used to help diagnose, but not prediabetes or gestational diabetes.

6. Relationship between Diabetes and Hypertension

The global medical journals state that diabetes and hypertension are interrelated. These two diseases are interlinked, which causes complications in the human body when not treated with proper medications. Therefore, taking medications for hypertension and blood glucose is vital to improve people's quality of life. Diabetes and hypertension have been found to have a significant overlap. Obesity, inflammation, oxidative stress, and significant insulin resistance are the primary causes of both diseases. Furthermore, according to medical news and publications, hypertension and diabetes are the leading risk factors for atherosclerosis and its complications [41]. Therefore, these risk factors often increase the chances of heart attacks and strokes, which are sometimes fatal and lead to higher mortality rates when accumulated together.

Forty-two percent of people with diabetes have normal blood pressure, while 56 percent maintain average glucose levels. In the United States, the situation differs, with a significant number of individuals affected by both type 1 and type 2 diabetes, as well as hypertension. Approximately 30% of patients are estimated to have type 1 diabetes, whereas 50% to 80% of patients with type 2 diabetes also suffer from hypertension [42]. However, the relationship between diabetes and hypertension varies by country. It is also due to genetic factors, environmental consequences, food habits, and lifestyle that lead to the occurrence and severity of disease in both countries.

Furthermore, genetic variants also improve the relationship between diabetes and hypertension. Variants such as angiotensinogen, adrenomedullin, apolipoprotein, and α-adducin are simultaneously associated with the development of hypertension and diabetes. In addition to the involvement of genes, environmental factors combined with a poor diet and lack of physical activities result in diabetes and hypertension. Obesity is significantly related to the high development of hypertension and diabetes. For this reason, in the United States and worldwide, awareness of obesity is highly prevalent. It is also the most crucial risk factor for hypertension and is related to type 2 diabetes. Brunström and Carlberg [43] state that obesity, hypertension, and diabetes are interrelated, sharing common susceptibility genes. Physical activity has a significant impact on diabetes and hypertension. Physical activities reduce the chance of obesity, and less fat accumulates in the human body, decreasing the rate of diseases [44]. According to the Da Qing-impaired Glucose Tolerance and Diabetes Study, it is estimated that 46% of people with regular physical activities have reduced their diabetic level.

Engaging in moderate to vigorous physical activities daily significantly reduces the risk of developing diabetes and hypertension. Despite the well-recognized benefits of regular exercise, many people are demotivated due to a lack of time and insufficient knowledge about appropriate physical activities. Addressing these barriers can help more individuals incorporate exercise into their daily routines, thereby improving their overall health.

Hence, it is highly evident from the above discussion that diabetes and hypertension are interlinked. Physical activities combined with the best lifestyle and healthy food intake and habits also reduce the chance that both diseases occur together. Therefore, hypertension and diabetes are related. However, some studies also state that hypertension and diabetes are not associated with obesity, lack of physical activity, and mental stress. The presence of specific genes simultaneously results in hypertension and diabetes.

7. Treatment of Diabetes Mellitus

Diabetes treatment is essential to decrease mortality rates significantly. ACE inhibitors (angiotensin-converting enzyme inhibitors) and ARBs (angiotensin II receptor blockers) are the most commonly used treatments. Diabetes also affects the kidneys, so these drugs protect the kidneys and significantly monitor blood

pressure. The primary goal of diabetic treatment is to maintain insulin control. Diabetes varies according to age, physical structure, and other complications. Consulting a physician is crucial for effective diabetes management. Regular physical activity and maintaining a healthy diet are essential components of diabetes management. These lifestyle changes can significantly improve overall health and help keep blood sugar levels in check.

The role of insulin is vital because it helps effectively control diabetes. People with type 1 diabetes require insulin as prescribed by the doctor to maintain health. Furthermore, the use of insulin in treating type 1 diabetes is vital because it helps protect the pancreas from significant damage [45]. However, in conjunction with insulin, it is also vital to control blood pressure with appropriate medication to reduce the fatality of the disease.

Type 2 diabetes is controlled and managed by diet and exercise and is also treated with medications and by injecting insulin into the human body. Therefore, the first treatment line includes medications such as Glumetza, Glucophage, Fortamet, and Riomet, commonly known as Metformin. Thus, using these drugs helps control glucose in the human body with greater efficiency and effectiveness, reducing disease fatality [46].

Metformin, a proven drug used for many decades to treat type 2 diabetes, is regarded as a first-line treatment by most scientists. In type 2 diabetes, the body's ability to use insulin effectively is impaired, leading to decreased insulin production. This results in less sugar being available as energy in cells and more sugar remaining in the bloodstream. Elevated blood sugar levels can eventually damage vital organs such as the heart, kidneys, nerves, and eyes [47]. While some risk factors for diabetes, such as heredity and aging, are unchangeable, they remain significant threats. However, health issues like being overweight or obese can be mitigated. Reducing 5 to 10% of baseline weight through a healthy diet and regular exercise is essential for preventing and treating type 2 diabetes.

Treatment options for this condition are characterized by diet adjustment and oral hypoglycemic medications, most of which have proven ineffective. At the same time, insulin therapy only temporarily solves the problem. Even when treated with the most up-to-date pharmacotherapies, patients continue to improve macro and microvascular problems. Diabetes is associated with an increased risk of cardiac and stroke death, kidney failure, blindness, and lower limb amputations (60 percent of all non-traumatic lower limb amputations). Therefore, alternative therapies aimed at different types of this disease must be carefully and responsibly investigated before being implemented. It is possible to obtain diabetes management after gastrointestinal bypass surgery and insulin administration. Diabetes, one of the leading causes of increased cardiovascular events in Western countries, places a significant financial strain on healthcare care, both direct and indirect expenditures, and negatively impacts the environment. Because of this, effective glucose control (maintenance of normal HbA1C, fasting, and postprandial glucose levels) is critical in avoiding the existing consequences

of this disease [48].

Insulin helps control the amount of sugar (glucose) in the bloodstream, helping prevent diabetes. When the hormone develops internally, patients with type I diabetes must rely on exogenous insulin (usually administered subcutaneously) to survive. Insulin resistance, insulin production deficit, or both are present in patients with type 2 diabetes mellitus. Certain Type II diabetes patients may require insulin therapy if other drugs cannot effectively control blood glucose [39]. Insulin for diabetes can be administered subcutaneously (under the skin) or intravenously (into a vein) (intravenously). Despite advancements in technology, subcutaneous insulin injections remain the gold standard of treatment for all people with type I Diabetes and most people with type II diabetes. Insulin injections can be performed with a needle and syringe, a cartridge system, or prefilled pen systems, among other methods. Insulin pumps are also available on the market today. The starting dose is estimated on the patient's weight and insulin levels, which change constantly and are determined by several factors. When insulin is administered subcutaneously, two-thirds of the daily dose is given during the day, and one-third is administered at night.

The developing countries and the low- to middle-income countries are the worst patients with diabetes, but proper management of diabetes helps to reduce mortality rates. Furthermore, there is no permanent cure for type 1 diabetes, but adequate control of the disease and strict and consistent monitoring help eliminate associated complications with the disease [49].

7.1. Effect of Metformin on the Management of Diabetes

Metformin is an oral antihyperglycemic drug that is extensively used to cure diseases. It is available in pill form. Because it reduces basal hepatic glucose production, it increases insulin sensitivity in the liver and peripheral tissues. It also improves glucose uptake in muscle and adipose tissue, which benefits people with diabetes [9]. As a result, it increases insulin action while simultaneously improving glucose control. Metformin reduces the need for insulin, and the amount of weight acquires a lot of its ability to promote insulin levels. Insulin metformin supplementation increased insulin sensitivity and reduced the incidence of type 2 diabetes complications compared to insulin alone. In people with prediabetes and type 2 diabetes, glucose has been shown to improve insulin sensitivity and lower insulin resistance. Only a few studies have investigated the effects of combining Metformin with insulin therapy in persons with type 1 diabetes. When it comes to type 1 diabetes, Metformin is not suggested as an additional therapy, unlike when it comes to type 2 diabetes.

Medical professionals prescribe various insulin-lowering medications to maintain the desired blood sugar level. Among the most commonly prescribed drugs for type 2 diabetes is Metformin. It plays a crucial role by decreasing glucose synthesis in the liver [50] and improving insulin sensitivity, allowing the body to utilize insulin more effectively. However, Metformin can have several potential side

effects, including B-12 deficiency, nausea, bloating, abdominal pain, and diarrhea.

Metformin generally comes in liquid or tablets and is usually taken by the patient with meals twice daily [51]. However, Metformin was rediscovered in the 1940s to treat influenza, but today, it is heavily utilized to control or maintain the body's sugar level. It generally decreases the glucose level from the usually absorbed food, thereby increasing the body's response to insulin. Metformin is not used to treat type 1 diabetes. It is considered a condition in which the body fails to produce insulin and thus eventually fails to control the blood sugar amount. Metformin is highly accredited in some studies because it reduces liver glucose production. Metformin is used significantly in treating type 1 diabetes because it enhances glucose uptake in the muscle and manages blood flow by combining proper nutrition.

Metformin is a highly regarded medication because it can increase insulin sensitivity, reduce insulin levels, and enhance insulin action [52]. It is particularly beneficial as it increases peripheral glucose uptake, aiding in managing type 1 diabetes by facilitating the flow of sugar into the body's cells. Metformin effectively regulates glucose control in type 2 diabetes, significantly altering insulin concentration levels, making it one of the safest and most effective medications for managing type 1 and type 2 diabetes. Its benefits extend beyond glucose control, as it also helps in weight management and has a low risk of causing hypoglycemia.

7.2. Case Study of Metformin Monotherapy

A 68-year-old male patient with type 2 diabetes mellitus was treated with Metformin monotherapy for two consecutive years. The patient was administered a daily dose of 2000 mg of Metformin and tolerated the treatment well. Key indicators showed the effectiveness of Metformin: the patient did not experience hypoglycemia, maintained controlled blood pressure levels, and managed mild hypertension. The patient's body mass index (BMI) decreased from 35 kg/m^2 to 28 kg/m^2. Mild hypertension was successfully managed with a combination of thiazide and an angiotensin-converting enzyme inhibitor. The patient's blood lipid levels were also controlled with a daily intake of 10 mg of medication, demonstrating the overall effectiveness of the treatment.

To monitor long-term blood glucose control, the patient underwent an HbA1c test, which resulted in a level of 7.6%. Concerned about this result, the patient consulted his doctor and inquired about the efficacy of canagliflozin (Invokana). The doctor discussed various available medications and recommended adding a dipeptidyl peptidase-4 (DPP-4) inhibitor to the treatment regimen to help manage weight gain [53].

The physician suggested the DPP-4 inhibitor as an add-on treatment because Metformin was effectively managing the patient's condition. This additional medication would help maintain stable blood glucose levels. As an alternative to Metformin, the doctor proposed a 3-month lifestyle adjustment trial or the use of other medications such as a glucagon-like peptide-1 receptor agonist (GLP-1RA),

a sodium-glucose cotransporter-2 inhibitor (SGLT-2), or an alpha-glucosidase inhibitor. However, the patient preferred oral medications and was reluctant to use GLP-1RA due to its association with insulin and the risk of genital mycotic infections, particularly as he was uncircumcised. The doctor did not prescribe alpha-glucosidase inhibitors due to their lower efficacy compared to DPP-4 inhibitors [54].

8. Conclusion

Diabetes is a chronic disease with severe health consequences, including heart disease, stroke, blindness, and kidney failure. The most prevalent effect of diabetes is high blood sugar, which can be fatal. Between 2014 and 2019, diabetes directly caused over 1.5 million deaths, with 45% of those deaths occurring before the age of 70. The relationship between diabetes and hypertension is significant, as they often occur together. Shared risk factors include obesity, inflammation, and insulin resistance. Both conditions are associated with an increased risk of atherosclerosis, potentially leading to heart attack and stroke. Individuals can take steps to reduce their risk of developing diabetes and hypertension, such as maintaining a healthy weight, eating a balanced diet, and exercising regularly. Regular checkups with a doctor can help detect and manage these conditions early on. While there is no cure for diabetes, it can be managed effectively through medication and lifestyle changes. With proper care, individuals with diabetes can live long and healthy lives.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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