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COMMENTARY

# Type 2 Diabetes and its Effect on the Elderly Population

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## Introduction

In 1500 B.C, Egyptians' scripts helped researchers discover that Indian doctors called diabetes, *madhumeha*, since ants were attracted to urine from certain individuals [1]. Later in 400-500 A.D, Indian physician, Sushruta, and surgeon, Charaka, recognized that there were two types, Type I and Type II diabetes [1]. In 1978, British surgeon, John Rollo, originated the word *mellitus*, which helped him discover that diabetes had another attribute, diabetes insipidus [1]. Diabetes insipidus is the creation of enormous amounts of weak, thin urine due to the kidneys not properly concentrating the urine, which is mostly produced because of dehydration and thirst [2]. However, diabetes mellitus (Type I & Type II) is when the pancreas can't generate enough insulin to manage glucose levels in the blood [2]. In Type I diabetes, the pancreas isn't making the right amount of insulin to help the glucose stabilize and enter the cell [2]. Individuals with Type I diabetes develop symptoms such as losing weight, urinating a lot, and being very thirsty [3]. Type II diabetes is a more complicated disorder that includes the pancreas, insulin system, liver, kidneys, gut, muscle, fat cells, and brain [4]. Type II diabetes symptoms are increased thirst, fatigue, blurred vision, and extreme weight loss [5].

### Type II Diabetes

Type II diabetes has affected the population with high rates of diabetes-related morbidity and mortality. Type II diabetes is a chronic disease in which your blood glucose is high. Glucose is the main source of energy that comes from the food that someone eats [6]. A hormone called insulin helps the cells receive energy from the glucose, but over time having a lot of glucose in your blood can cause health problems. Some health problems that elderly people can develop are heart disease, kidney disease, dental disease, and nerve damage.

### Development and Symptoms of Type II Diabetes

Type II diabetes may be caused by being overweight, not being physically active, or the genetics of your family. Having extra weight can cause insulin resistance and Type II diabetes usually starts with insulin resistance. Insulin resistance is when cells in the muscles, fat, and liver don't respond well to

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insulin and can't easily take up glucose from the blood [7]. As a result, the pancreas makes more insulin to make the cells receive the glucose it needs. Over time, the pancreas will not be able to make enough insulin and the blood glucose levels will rise [7]. Type II diabetes symptoms include an increase in hunger, thirst, and urination. It also includes blurred vision, sores that don't heal, and numbness or tingling in the feet or hands [8].

## Risk Factors of Type II Diabetes

Type II diabetes affects all people around the world, including, Hispanics/Latinos, African Americans, and Alaska Natives. This is due to genetic, environmental, and metabolic risk factors. The majority of the population has been at high risk of developing Type II diabetes because of poor alimentation and physical inactivity. Genetics and lifestyle are the main risk factors that lead to the development of Type II diabetes. People with insulin resistance can have the same risk factors as Type II diabetes patients. The development of risk factors can help individuals have early detection and treatment and reduce later complications. [9-10].

## Type II Diabetes Diagnosis

Type II diabetes is diagnosed to help individuals reduce and manage the glucose levels in the body. It is diagnosed by taking blood tests which help the doctors determine if blood sugar is high or low. There are four different tests that can evaluate the blood glucose level: A1C, Fasting Plasma Glucose (FPG), Oral Glucose Tolerance Test (OGTT), and Random Plasma Glucose Test. The A1C test calculates the blood sugar from the previous two or three months [11]. The A1C test is a blood test where blood is drawn from the vein in your arm and then they are sent to a lab for analysis [12]. The Fasting Plasma Glucose test examines the glucose by not having anything to eat or drink for a minimum of 8 hours before the test and this test is done in the morning prior to breakfast [11]. The Oral Glucose Tolerance Test checks the blood glucose levels before and two hours after drinking a high-sugary drink which helps the doctor determine the way your body metabolizes sugar [11]. The Random Plasma Glucose Test is tested on individuals that have critical diabetes symptoms and is diagnosed at any moment throughout the 7day [11]. In addition, this test is done by a puncture in the finger to draw a small amount of blood and is then put onto a test strip which will give the glucose levels [13].

## Prevalence of Type II Diabetes

Diabetes is a worldwide epidemic, affecting 415 million people and about 193 million undiagnosed [14]. It affects 25% of the population of people over the age of 65, and the percentage continues to increase rapidly [15]. According to the American Diabetes Association, in 2019, 37.3 million Americans, or 11.3% of the population had diabetes. The percentage of Americans 65 and older remains high at 29.2% or 15.9 % of million seniors (diagnosed and undiagnosed, respectively) [16]. In the United States, diabetes is the seventh leading cause of death, and approximately 95% percent of 37 million Americans have Type II diabetes [17-18]. Among these patients, adults over 65 years of age are more prevalent to develop Type II diabetes because of natural insulin decrease. The rates of Type II diabetes steadily increase in age, but it can be developed at any time. It is important to be aware of the circumstances and symptoms of Type II diabetes, whether you're healthy or not. Managing diabetes is crucial because it can cause serious health problems over time like heart disease, stroke, kidney disease, eye problems, and nerve damage that can possibly lead to amputation. Along with health problems, patients with Type II diabetes have a greater risk for cancer and Alzheimer's disease [19].

Living in a state that has one of the highest rates of diabetes that constantly exceeds the national average, Texas, the concern on diabetes is a constant issue [17]. In addition, the circumstances of living in an area that has the highest rates of obesity in the country comes with many health concerns, along with the prevalence of diabetes [20]. The Rio Grande Valley faces a burden of high rates of diabetes that are almost three times as high as the general population of the United States [21].

A study from UTRGV compared diabetes prevalence in the Rio Grande Valley's four counties with the United States between the years 2004-2017 [22]. Results show that the prevalence of diabetes in the United States increased by 1.5% while the Rio Grande Valley's prevalence increased by 6.33%. The highest increase within the Rio Grande Valley was in Willacy County with an increase of 11.6%. The study did not differentiate between the 2 types of diabetes, however, 95% of the diabetic cases account for Type II diabetes [22].

On the other hand, the Rio Grande Valley is populated by 91.5% of Hispanics, as of 2019, and statistics from the CDC show that Hispanic or Latino people are 17% more likely to develop type 2 diabetes

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than non-Hispanic people, which is 8% [23-24]. Along with a higher risk, Hispanic or Latino adults have a more than 50% chance of developing Type II diabetes [24]. The same study from UTRGV displays another outcome of the study shows that Hispanics have one of the highest prevalence among the race-ethnic groups with an increase of 2.4% [22]. The statistics highlight the importance of continuing to evaluate all populations; specifically, the elderly who are affected by Type II diabetes.

## Frailty in Elderly Patients with Diabetes

Type II diabetes in older patients has become a concern because it leads to falls, disability, hospitalization, care home admission, and even mortality [25]. Elderly patients with type II diabetes face various complications that include triopathy, retinopathy, neuropathy, nephropathy, and macrovascular complications. Diabetes has been a risk factor for older people which develops a physical disability, bone fractures, cerebrovascular disease, heart disease, and hypertension [26]. Frailty includes damage to older patients' eyesight, physical, and mental disabilities.

Frailty is the loss of homeostasis and vulnerability to various stressors. The presence of frailty in a diabetic patient causes deterioration in muscle and nerve function [26]. Frailty is not only the physical incompetence of a person but also the psychological complexity. For example, patients with type II diabetes tend to suffer from depression, stress, and poor eating habits [27]. Sarcopenia is an age-related, involuntary loss of skeletal muscle mass and strength. Diabetes causes an increase in sarcopenia in older patients, it will deteriorate muscle mass and strength faster. [28]

Diabetic retinopathy is an eye condition that causes vision loss and blindness in people who have diabetes. Symptoms of diabetic retinopathy include dark, floating spots or streaks that look like cobwebs. This is caused by blood vessels in the retina starting to bleed into the vitreous. Although these spots can clear on their own, it is important to get treatment to avoid scarring. Doctors test patients with diabetes using a test called fluorescein angiogram which presents pictures of the blood vessels in a retina [29]. In order to avoid diabetic retinopathy patients must manage their diabetes. Keeping their blood sugar at a healthy range and consistently visiting their doctors can help them avoid getting diabetic retinopathy. Older patients must maintain a regular routine of physical activity, comparison on the prevalence of diagnosed diabetes in the United States between Hispanic and Non-Hispanic White, Black, and Asian race-ethic groups. The

eat healthily, and carefully follow their doctor's instructions on insulin intake and other diabetes medicines. Treatments used for diabetic retinopathy include injections, laser treatment, and eye surgery [30].

Cardiovascular disease is the leading cause of death in people with type II diabetes. People with diabetes have a greater risk of having a CVD event. The high blood sugar in type II diabetes damages blood vessels and the nerves that control the heart. Artery walls are damaged causing heart failure. [31]

## Afflictions of Type II Diabetes

The elderly population with Type II diabetes can undertake a lot of disorders. A few conditions that develop due to the disease may include eye damage, skin conditions, nerve damage, and sleep apnea [32]**.** As blood sugar levels increase, the insulin-producing beta cells in the pancreas release more insulin, causing cells to become impaired and unable to develop enough to meet the body's demands [33]. As a result, the risk of receiving eye damage from Type II diabetes is elevated.

Blindness is one of the potential long-term effects because of damaged blood vessels in the retina which can eventually lead to blinding afflictions such as cataracts and glaucoma [30]**.**

Additionally, nerve damage may be caused because of high blood sugar. Indication of neuropathy could be identified by tingling, numbness, burning, or loss of feeling that usually begins at the tips of toes or fingers. Elders are usually likely to underestimate the damage to their diabetic foot. Involving injuries leading to amputations. Generally, the damage spread upward throughout one [32]. Nausea, vomiting, diarrhea, or constipation are factors that may take place. In men, the damage may cause erectile dysfunction [34]. Obstructive sleep apnea is a frequently common condition in people with Type II diabetes [32]. This regard sleeping disorders which repeatedly come and go. Snoring loudly and feeling intriguingly tired may be signs of sleep apnea.

Diabetics are substantially more prone to this because of alterations made in glucose metabolism. Though treating this sleeping disorder has been proven to also assist in helping your blood sugar levels [35].

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## Treatments for Type 2 Diabetes

Treatment for type II diabetes has been helpful in many patients. Elderly patients have been exposed to a variety of treatment options that are continuously being studied. Common non-insulin antidiabetic drugs such as, "Biguanides," Sulfonylureas, and Thiazolidinediones, are, however, the most cost-effective treatments used on elderly patients [36].

Metformin is a significant drug used in the treatment of type II diabetes. It is effective in lowering blood glucose, increasing insulin sensitivity, and reducing cardiovascular and hypoglycemia risk [36]. The main use of metformin is that it can treat hyperglycemia in type 2 diabetes and the improvement of glycemic control [37]. An addition to the medication is the importance of activating AMP-activated protein kinase (AMPK) and interpreting hepatic gluconeogenic genes and decreasing the development of impaired glucose in patients, with metformin, however, it stimulates AMPK which signals mediated cancer cell apoptosis, and if the metformin isn't given gluconeogenesis will come into lay and suppress AMPK and ATP production for the cells which would worsen the type II diabetes [38]. It is, however, cautiously used in elderly diabetic patients with the concerns of them having lactic acidosis, gastrointestinal effects such as nausea, vomiting, diarrhea, flatulence, the reduction of calorie intake, and extreme weight loss [36].

Sulfonylureas are a recommended second line of treatment, however, it is commonly used as a first. Sulfonylureas directly islet B cells to closed ATP-sensitive K+ channels and stimulate the secretion of insulin [36]. There are more cardiovascular effects that come into play when taking sulfonylureas. Even though it is a cautious drug that should not be used a lot, its medication helps with the treatment of type II diabetes [39]. The drug is cost-effective; however, it increases higher risks of ischemic stroke, cardiovascular death, and all-cause mortality in matched cohorts [39]. Although the use of sulfonylureas is still common in everyday medicine, doctors are cautious when prescribing the medication to patients.

Thiazolidinediones is a type of insulin sensitizer, including troglitazone, rosiglitazone, and pioglitazone. It is a receptor that controls normal skeletal muscle and hepatic insulin sensitivity. The action of thiazolidinediones is to regulate hyperglycemia than sulfonylureas and metformin and does not increase the risk of hyperglycemia [36]. The three treatments of TZD pioglitazone, rosiglitazone, and troglitazone are effective in elderly patients but should be used cautiously with some health defects occurring when on the medication [36]. Pioglitazone is well treated in elderly patients with renal impairments and type II diabetes, and it does not cause hypoglycemia, however, it should be avoided in patients with congestive or class III-IV heart failure. Unlike, pioglitazone, rosiglitazone and troglitazone are medications for TZD that have been removed from any pharmacy market, due to patients increased risk of myocardial infarction and idiosyncratic hepatotoxicity [36].

## Conclusion

Type II diabetes has caused many downfalls in the history of humanity, especially for the elderly. Almost 30 percent of the United States population over the age of 65 have been diagnosed with this type II diabetes and as a result, caused harm to the elderly patient [40].

Complications in an elderly patient with Type II diabetes can be severe especially if they are over the age of 65; In some cases, the alarming signs can help the patient identify type II diabetes in time so that they are able to treat it properly [41]. In some cases, it may be difficult to recognize any signs or symptoms. This may delay finding excellent and helpful treatment in time to treat this type II diabetes [14].

Over the years, research has shown that type II diabetes can cause severe harm to a patient and even death if not treated with time. Each year the incidence keeps rising in the elderly population. For many elderly individuals, type II diabetes can be manageable. [17].

This has become an important issue particularly in Texas and in the Rio Grande Valley because of our Hispanic population and the increased number of elderlies with Type II diabetes.

This is why we need more research to be done and tailored medical care so that we can be able to get better treatment based on the research results.

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