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The Interplay of Obesity, Diabetes, and Cardiovascular Disease: A Comprehensive Analysis of Risk Factors, Dietary Habits, and Treatment Strategies

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Abstract

Obesity is a huge concern for people worldwide, as we all know. Obesity and diabetes are increasing in diabetic individuals these days. As a result, multiple comorbidities, such as cardiovascular disease, diabetic nephropathy, and retinopathy, may become more prevalent. In this study, the epidemiology of obesity and diabetes is discussed to determine what is causing our country's rising death rate, how diabetes and obesity influence people, and how they contribute to cardiovascular disease. This study describes the foods suggested to avoid diseases such as obesity and diabetes, leading to cardiovascular disease, focusing on lifestyle changes and eating habits. These also explain what effective treatments, such as periodic antilipidemic medications and procedures, such as bariatric surgery for obesity and anti-diabetes medication for diabetes, are available on the market. However, before using external sources, such as drugs, we should improve our health by eating healthy meals daily. Some of these foods are also included in studies to see which foods prevent specific diseases.

Keywords

Obesity, Diabetes, Cardiovascular Disease, Dietary Habits, Treatment Strategies

1. Introduction

Glucose, a monosaccharide sugar, is the primary energy source for the human body, derived from dietary intake [1]. An elevation in blood glucose levels can result in diabetes mellitus [2]. The regulation of blood glucose is mediated by insulin, a hormone produced by the pancreas, which facilitates the maintenance of

normoglycemia [3]. In instances where the pancreas fails to secrete adequate insulin, exogenous insulin administration becomes necessary to manage hyperglycemia, a condition that poses a significant risk for cardiovascular disease. Diabetes mellitus manifests in two primary forms: Type 1 diabetes, characterized by an absolute deficiency in insulin production, and Type 2 diabetes, which is marked by insulin resistance.

According to the World Health Organization, diabetes is one of the leading causes of death, with statistics showing an increase from 108 million affected individuals in 1980 to 422 million in 2014. Diabetes is less prevalent in high-income countries than in low-income countries, where inadequate medical facilities and treatment alternatives exacerbate the problem. However, according to Deshmukh and Jain [4], there is a 5% increase in premature mortality rates due to the adverse effects of diabetes. By analyzing previous reports, it is estimated that diabetes is one of the leading causes of death worldwide [4]. Therefore, proper treatment, screening, and changes in eating habits help mitigate severe complications.

The U.S. is particularly affected by diabetes and heart disease due to uncontrolled food habits, such as the consumption of processed foods and meats. According to reports published by U.S. health authorities, in 2018, 34.2 million people, representing 10.5% of the total population, were severely affected by diabetes, leading to an increase in death rates [5]. Diabetes is a major concern that severely affects people's health when left untreated. Therefore, the accurate and adequate management of complications, analysis of risk factors, robust treatment, and other preventive measures are vital to reducing mortality rates in the country.

2. Obesity

Obesity has become a modern epidemic, promoting a dramatic increase in the prevalence of diabetes and cardiovascular diseases. It may be caused by genetics, or it may be caused by the food we take, the medications we use, or due to our lifestyle changes. Obesity is an excess buildup of adipose tissue that affects physical and psychological health and well-being. Obesity is seen as a public health emergency in both developed and developing countries. The pandemic must be avoided when the economic costs, social hazards, morbidity, and death of the disease are considered. People who lose weight may reduce their risk of cardiovascular disease (CVD), diabetes, obstructive sleep apnea (OSA), and hypertension, among other complications [6].

Obesity has become a universal public health concern. Obese people are more likely to experience cardiovascular disease (CVD), gastrointestinal problems, type 2 diabetes (D2), and breathing difficulties. [7]. Obesity-related diabetes is called diabesity, which means that diabetes is caused by obesity and relates to other comorbidities, but it is not officially diagnosed. Sometimes obesity shows silent characteristics that do not show any adverse effects, and people think they are fine with their health because there will be no disturbance at the time of diagnosing a disease, but it shows long-term effects.

3. Obesity and Diabetes: What Is the Connection?

The food gets digested once we have it. This same glucose is released into the bloodstream, and the pancreas chooses to release insulin into the bloodstream, which enables the cells to uptake the glucose and produce energy; this is a normal daily process. When there is a large amount of glucose, the cells take just what they need to produce energy, and the rest is stored in the liver as glycogen. If this continues for many days, the pancreas will produce less insulin, decreasing blood sugar control due to continuous insulin release [8]. However, it is important to note that not everyone who is obese will develop diabetes; it all depends on circumstances such as family history, lifestyle, and other factors. While obesity is a significant risk factor for Type 2 diabetes, it is not linked to Type 1 diabetes, which is not associated with lifestyle factors.

Nutrition and Chronic Disease

Unsaturated fats are primarily found in plant-based foods and oils [9] [10]. Key sources include nuts, seeds, avocados, and olive oil. These fats benefit heart health as they help reduce low-density lipoprotein (LDL) cholesterol levels, often called "bad" cholesterol [11]. Unsaturated fats can increase the activity of LDL receptors in the liver [12]. These receptors remove LDL cholesterol from the bloodstream [13]. When these receptors are more active, they can clear LDL cholesterol more efficiently, leading to lower levels in circulation [13].

By lowering LDL cholesterol, unsaturated fats can reduce the risk of cardiovascular disease [14]. Additionally, unsaturated fats, particularly omega-3 fatty acids found in fish, flaxseeds, and walnuts, have anti-inflammatory properties that contribute to cardiovascular health. Replacing saturated fats with unsaturated fats in the diet has been shown to lower the incidence of heart disease and improve overall lipid profiles [15].

Saturated fats are typically found in animal-based products and certain plant oils. Common sources include red meat, full-fat dairy products, butter, and processed foods [16]. These fats are solid at room temperature and have been linked to increased LDL cholesterol levels in the blood [16]. High intake of saturated fats is associated with a higher risk of cardiovascular disease, as elevated LDL cholesterol can lead to the buildup of plaque in the arteries, increasing the risk of heart attacks and strokes. The American Heart Association recommends limiting saturated fat intake to less than 6% of total daily calories to reduce the risk of heart disease.

Trans fats are found in many processed and fried foods, including margarine, baked goods, and fast food (17). These fats are created through an industrial process that adds hydrogen to liquid vegetable oils to make them more solid, known as partial hydrogenation [18]. Trans fats are particularly harmful because they raise LDL cholesterol levels and lower high-density lipoprotein (HDL) cholesterol, known as "good" cholesterol [17]. This dual effect significantly increases the risk of cardiovascular disease. The consumption of trans fats has been strongly linked

to an increased risk of heart disease, stroke, and Type 2 diabetes. Due to their adverse health effects, many countries have implemented regulations to reduce or eliminate trans fats from the food supply [19]. Table 1 provides an overview of nutrients, sources, impact on health, and associated chronic disease.

Table 1. Nutrition and chronic diseases.

Nutrient Type	Sources	Health Impact	Associated Chronic Diseases
Unsaturated Fats	Nuts, seeds, avocados, olive oil, fish	Lowers LDL cholesterol, anti-inflammatory properties	Reduced risk of cardiovascular disease
Saturated Fats	Red meat, full-fat dairy products, butter	Raises LDL cholesterol, increases plaque buildup in arteries	Increased risk of cardiovascular disease, stroke
Trans Fats	Processed foods, fried foods, margarine	Raises LDL cholesterol, lowers HDL cholesterol, increases inflammation	Increased risk of cardiovascular disease, stroke, type 2 diabetes
Sugars and Sweets	Sugary drinks, candies, baked goods	Increases blood glucose levels, contributes to insulin resistance	Increased risk of diabetes, stroke, coronary heart disease
Red Meat	Beef, pork, lamb	High in saturated fats, can increase LDL cholesterol	Increased risk of cardiovascular disease, cancer, diabetes
Alcohol	Beer, wine, spirits	Excessive intake can lead to liver damage, increases blood pressure	Increased risk of cardiovascular disease, liver disease
Caffeine	Coffee, tea	Moderate consumption can improve heart health	Reduced risk of heart disease (with moderate intake)
Sodium	Table salt, processed foods	High intake can raise blood pressure	Increased risk of hypertension, cardiovascular disease
High Fiber Foods	Whole grains, fruits, vegetables, legumes	Improves digestion, helps regulate blood sugar levels	Reduced risk of diabetes, cardiovascular disease
Omega-3 Fatty Acids	Fish, flaxseeds, walnuts	Anti-inflammatory properties, improves heart health	Reduced risk of cardiovascular disease

4. Reasons for the Increase in Death Rates

In recent years, half of the deaths in the U.S. were due to heart disease, stroke, and type 2 diabetes. In general, the increase in mortality was caused by poor eating habits that resulted in inadequate nutritional intake. That populace did not consume healthy living foods, leading to the death of the highest number of individuals with heart disease [20]. It was also reported that Americans were accustomed to processed meals containing saturated fats, resulting in a surge in the body's triglyceride levels. The accumulation of extra fat in the human body causes many deaths in the United States.

Peer-reviewed reports have identified that the U.S. population tends to consume high levels of sodium, primarily through processed foods. Additionally, the intake of processed meats, sugar, and sweetened beverages has been linked to increased mortality rates. There is also a notable preference for unprocessed red meat, which has significant health implications [21]. Furthermore, the consumption of high-fiber foods and healthy fats, such as those found in fruits, vegetables,

seeds, whole grains, nuts, polyunsaturated fats, and omega-3 fish fats, is relatively low. The dietary pattern of high saturated and trans fats and low healthy fats has been linked to higher mortality rates in the country [22].

There was no restriction on the consumption of foods among the different age and population groups. Older adults were severely affected, and a higher number of deaths were noticed in men when compared to the women of the U.S. population. People with minimal education levels were more severely affected than those with higher education because the latter had an idea of the importance of a healthy diet for better survival [23]. Therefore, lack of priority in health, lack of proper guidance in health planning, and inadequate adoption of good eating habits lead to the severity of the disease, resulting in significantly higher mortality rates.

5. Signs, Symptoms, and Causes of Diabetes and Heart Disease

Diabetes is generally classified into Type 1 Diabetes and Type 2 Diabetes. Therefore, for both type 1 and type 2 diabetes, the symptoms are common, so it becomes difficult for people to identify their health problems in the initial days. The typical symptoms of each diabetes include increased urination, thirst, hunger, weight loss, lack of patience, and blurred vision, and ketoacidosis is also one of the major problems related to type 1 and type 2 diabetes [24]. Moreover, the healing rate after any infections is significantly low. Excess glucose is mainly eliminated through urine because excessive glucose is reabsorbed in the nephrons about 180mmol/L more than the excess glucose is eliminated through urine, which can lead to urinary tract infections. The main difference between type 1 and type 2 diabetes is that type 1 diabetes is detected at any age, especially in adolescence and childhood, while type 2 diabetes affects people over 40 years [25]. However, due to our unhealthy habits, we are exposed to diabetes in the early stages of our life.

Obesity and uncontrolled weight are the leading causes of diabetes. Diabetes is caused when the pancreas does not produce the optimum insulin level in the body.

Table 2. Symptoms of heart disease.

Symptom	Description
Chest Pain (Angina)	Discomfort, pressure, or pain in the chest, often triggered by physical activity or stress.
Shortness of Breath	Difficulty breathing or feeling breathless, especially during physical exertion or while lying down.
Fatigue	Unusual tiredness or lack of energy, even with minimal exertion.
Palpitations	Irregular or rapid heartbeats, often described as a fluttering sensation in the chest.
Swelling (Edema)	Swelling in the legs, ankles, feet, or abdomen due to fluid buildup.
Dizziness or Lightheadedness	Feeling faint, dizzy, or lightheaded, sometimes leading to fainting (syncope).
Nausea or Vomiting	Feeling sick to the stomach or vomiting, which can accompany a heart attack.
Sweating	Excessive sweating, often cold and clammy, which can occur during a heart attack.
Pain in Other Areas	Pain or discomfort in the arms, back, neck, jaw, or stomach, which can be a sign of a heart attack.
Persistent Cough	A cough that produces white or pink blood-tinged mucus, indicating heart failure.

Consumption of alcohol, bad eating habits, smoking, obesity, and aging are notable causes of diabetes. These aspects also lead to the development of pathogenesis for Type 1 and Type 2 diabetes [26].

Heartburn, numbness, chest discomfort, and breathing difficulty are some of the symptoms of heart disease, see Table 2 for a more detailed list of symptoms. Most of the causes of heart disease are poor diet management, stress, obesity, and diabetes [27]. Obesity can lead to the accumulation of fat in the blood vessels, resulting in increased blood pressure and a higher risk of stroke, among other causes.

6. Treatment

Treatment of obesity is one of the most important challenges. There are many treatments and surgical procedures for the treatment of obesity. Some treatments, like statins, are lipid-lowering agents, and some surgeries include bariatric surgery, the most commonly performed treatment option. Furthermore, some bariatric surgeries include Adjustable Gastric Banding (AGB) and vertical sleeve gastrectomy (VSG). In this case, about 80% of the stomach is removed and stabilized by this. There will be a reduction in the stomach size, and a small amount of food is taken into the stomach. These surgeries help in diabetic remission and weight loss with restricted calorie intake [3].

Diabetes treatment is vital for patients who suffer from severe complications from diabetes; furthermore, diabetes is mainly caused when people do not follow optimal nutrition and healthy eating habits. These two factors also lead to severe cardiovascular disease. Therefore, the best treatment options are following a nutritious and healthy diet, exercising, and regularly taking medicines in an accurate dosage to reduce disease complications [23]. Doctors suggest external insulin therapy in critical cases for efficient and effective disease management. See Table 3 for examples of treatment for diabetes.

Table 3. Treatment for obesity.

Treatment Type	Examples	Description
Surgical	Bariatric Surgery (e.g., Gastric Bypass, Sleeve Gastrectomy, Adjustable Gastric Banding)	Surgical procedures that reduce the size of the stomach or reroute the digestive tract to limit food intake and absorption.
Pharmaceutical	Orlistat, Phentermine, Lorcaserin, Naltrexone-Bupropion	Medications that reduce appetite, increase feelings of fullness or decrease fat absorption.
Injectables	Liraglutide (Saxenda), Semaglutide (Wegovy)	Injectable medications that mimic hormones to regulate appetite and food intake.
Exercise	Aerobic Exercise (e.g., walking, running, cycling), Strength Training	Physical activity helps burn calories, build muscle, and improve overall health.
Diet	Low-Carbohydrate Diet, Mediterranean Diet, Ketogenic Diet, Calorie-Restricted Diet	Dietary plans that focus on reducing calorie intake, improving nutritional quality, and promoting weight loss.

6.1. Lifestyle Intervention

Current guidelines from organizations such as the World Health Organization (WHO) and the American Heart Association (AHA) provide specific recommendations on the type, intensity, and duration of physical activity suitable for different age groups and health conditions [28]. For instance, the AHA recommends that adults engage in at least 150 minutes of moderate-intensity aerobic activity or 75 minutes of vigorous-intensity aerobic activity per week, combined with muscle-strengthening activities two or more days per week [29]. Children and adolescents should aim for at least 60 minutes of moderate to vigorous physical activity daily [30]. Beyond weight management, regular exercise offers numerous health benefits, including improved insulin sensitivity, which helps manage diabetes, reduced cardiovascular risk, and enhanced mental health by alleviating symptoms of depression and anxiety. These benefits underscore the importance of incorporating physical activity into daily routines to promote overall health and well-being.

6.2. Diabetes Medications

Diabetes medications play a crucial role in managing blood sugar levels and preventing complications in individuals with diabetes. These medications work through various mechanisms to improve insulin sensitivity, increase insulin production, or reduce glucose absorption. The choice of medication depends on the type of diabetes, disease severity, and individual patient needs.

Oral hypoglycemic agents are commonly used to manage type 2 diabetes. These medications are taken by mouth and can be classified into several categories based on their mechanisms of action:

- Biguanides (e.g., metformin): These medications decrease glucose production in the liver and improve insulin sensitivity in muscle and fat tissues [31].
- Sulfonylureas (e.g., glimepiride, glipizide): These medications stimulate the pancreas to produce more insulin [32].
- Meglitinides (e.g., repaglinide, nateglinide): Similar to sulfonylureas, these medications also increase insulin secretion from the pancreas [33].
- Thiazolidinediones (e.g., pioglitazone, rosiglitazone): These medications improve insulin sensitivity in muscle and fat tissues [34].
- Alpha-glucosidase inhibitors (e.g., acarbose, miglitol): These medications slow down the digestion and absorption of carbohydrates, helping to prevent spikes in blood sugar levels after meals [35].
- DPP-4 inhibitors (e.g., sitagliptin, saxagliptin): These medications increase the levels of incretin hormones, which stimulate insulin release and decrease glucagon secretion [36].
- SGLT2 inhibitors (e.g., canagliflozin, dapagliflozin): These medications block the reabsorption of glucose in the kidneys, leading to increased glucose excretion in the urine [37].
- Non-insulin injectables are another class of diabetes medications that are

administered through injection. These medications are often used in combination with oral medications or when oral medications alone are not sufficient to control blood sugar levels. Some examples of non-insulin injectables include:

- GLP-1 receptor agonists (e.g., liraglutide, semaglutide): These medications mimic the effects of incretin hormones, stimulating insulin release, decreasing glucagon secretion, and slowing gastric emptying [38].
- Amylin analogs (e.g., pramlintide): These medications slow gastric emptying, suppress glucagon secretion, and promote feelings of fullness, helping to control blood sugar levels after meals [39].

6.3. Technology in Diabetes Management

Technological advancements have revolutionized diabetes management by providing individuals and healthcare providers with tools for improved monitoring, treatment, and disease management.

6.3.1. Continuous Glucose Monitoring (CGM)

CGM systems use a small sensor inserted under the skin to measure glucose levels in the interstitial fluid continuously. These systems provide real-time glucose data, including trends and alerts for high or low glucose levels, enabling individuals and healthcare providers to make more informed decisions about diabetes management. The benefits of CGM include:

- Improved glycemic control
- Reduced risk of hypoglycemia
- Increased awareness of glucose fluctuations
- Enhanced quality of life

6.3.2. Insulin Pumps

Insulin pumps are small, computerized devices that deliver insulin continuously through a small catheter placed under the skin. These systems can be programmed to deliver basal insulin rates as well as bolus doses for meals and corrections, providing more precise insulin delivery and flexibility in diabetes management. The benefits of insulin pumps include:

- Improved glycemic control
- Reduced risk of hypoglycemia
- Increased flexibility in lifestyle
- Improved quality of life

6.3.3. Other Emerging Technologies in Diabetes Management Include

- Smart pens: These devices track insulin doses and provide reminders for injections.
- Automated insulin delivery (AID) systems: These systems, also known as "artificial pancreas" systems, combine CGM and insulin pump technology to adjust insulin delivery based on real-time glucose data automatically.
- Mobile health (mHealth) apps: These apps provide tools for tracking blood

glucose, medications, and other health data, as well as educational resources and support for diabetes management.

6.4. Limitations of Technology in Diabetes Management

While technology has significantly improved diabetes management, it is important to be aware of the limitations:

- Cost: CGM systems, insulin pumps, and other technologies can be expensive, and insurance coverage may vary.
- User error: Proper use of technology requires training and ongoing education.
- Data overload: CGM systems generate a large amount of data, which can overwhelm some individuals.
- Technology dependence: Some individuals may become overly reliant on technology and neglect other aspects of diabetes management, such as healthy eating and exercise.

Technology plays an increasingly important role in diabetes management, providing individuals and healthcare providers with tools for improved monitoring, treatment, and self-management.

7. Diabetes with Food Habits and Heart Disease in the U.S.

Diabetes and heart disease are directly related to the eating habits of people. Without a balanced and healthy diet, it becomes difficult to maintain a perfect glucose level in the body. However, when glucose in the body is not perfectly controlled, it requires regulation through external medicine for control and management. Therefore, balanced consumption of carbohydrates, fruits, vegetables, whole grains, beans, and low fat is vital to control the glucose level in the human body. Diabetes also damages the nerves and the overall immune system, so healthy and balanced food habits and regular diets help to reduce complications significantly [40].

Furthermore, the food habits of the U.S. people have led to substantial death rates in the past few years. With more awareness programs on dietary habits, diabetes, and heart disease, the country's citizens have become more aware of dying from cardiometabolic diseases. According to recent reports from the country, people have become more careful about their eating habits, focusing on nutritious meals over foods high in unsaturated fats and processed meat. Some foods include sodium, fruits, vegetables, whole grains, processed and unprocessed meat, and sugar-sweetened beverages. Therefore, consuming a higher intake of these foods paves the path for heart disease, which also incurs mortality rates, while less consumption of these foods leads to proper maintenance of dietary charts for healthy sustenance. Men were primarily affected in the U.S. than women due to unhealthy diets [41].

According to reports published by the Journal of the American Medical Association, young people in the country are at higher risk than older people because their food habits constitute unhealthy intake of foods and suboptimal diets. The journal also states that blacks or Hispanics are at higher risk than whites. On the

other hand, educated people are less affected than their uneducated counterparts. However, the ongoing awareness program in the country has led to control of the mortality rates due to diabetes, food habits, and cardiovascular diseases. Between 2012 and 2020, there has been a considerable difference in mortality rates because people have become more aware of the consequences of the disease [42]. Therefore, they are more concerned with their self-management by rectifying their eating habits so that diabetes and heart disease do not affect the population. Consuming a healthy diet, such as the intake of polyunsaturated fats, nuts, and seeds, whole grains, vegetables, and fruits, and less consumption of sugar-sweetened beverages, has improved the healthy living of Americans.

In collaboration with the National Institutes of Health, the American Heart Association states that mortality rates due to food habits, diabetes, and cardiovascular diseases have declined significantly. Initiatives such as evidence-based approaches to changing behavior and the implementation strategies for healthy diabetes management have led to the effective management and prevention of the disease, as evidenced by the 2020 statistics. Due to the strategic goal formulated by the American Heart Association, the cardiovascular health of Americans increased by 20%, while mortality rates due to cardiovascular disease and stroke decreased by 20%. The American Heart Association's primary goal is to reduce disease centered on certain factors, improve diet quality, reduce smoking among men, and prioritize health factors such as blood cholesterol, blood pressure, and blood glucose [43]. The American Heart Association prioritized these factors because they have helped reduce the severity of the disease.

8. Risk Factors

Several important risk factors contribute to the development of diabetes and heart disease. Family history plays a significant role, as the inheritance of genes from first-degree relatives, such as parents, can increase an individual's risk of developing these conditions [44]. Age is another critical factor; while diabetes can affect individuals of any age, it is more commonly diagnosed in people over forty years old [45]. This age-related risk is due to various factors, including changes in metabolism and the cumulative effects of lifestyle choices over time [45].

9. Complications

The complication of diabetes is very serious because it leads to hyperglycemia, the most common complication of diabetes. Hyperglycemia also affects the overall immune system, vascular tissues, and normal functioning of the body. Over time, hyperglycemia leads to acute severity, damaging the overall system. It also affects the sensory and motor nervous system, leading to nerve dysfunction. Diabetes associated with heart disease also leads to critical illnesses such as coronary artery disease, increasing mortality rates. Diabetic complications also affect the kidneys, the retina, and the nerves. Neuropathy is also a common complication of diabetes with heart disease. Therefore, [46] states that multiple complications are caused

by diabetes and heart disease, which affect the quality of life of people.

10. Management

The appropriate management of the disease is vital to reducing death rates related to cardiometabolic issues. The country's government implemented stringent measures to reduce the economic and health burdens of cardiometabolic diseases in the U.S. In the healthcare system of the U.S., there have been significant changes in clinician education, multidisciplinary care teams have been implemented, electronic healthcare systems quality guidelines have been improved, and lifestyle counseling and behavior changes have been facilitated [47]. Hence, it led to the improvement in the country's healthcare system. Management of diabetes is extremely essential for leading a healthy and quality life. The appropriate management strategies are vital for reducing the mortality rates of patients. Managing blood sugar levels within range is a challenging task. Therefore, appropriate management is possible when food habits and physical activities are included in the daily routine.

Knowing what carbohydrate intake is the best portion is vital because carbohydrates have the largest impact on blood sugar levels. A balanced meal and the right medication time also help properly manage the disease. Avoiding sweetened beverages is also important because sweetened beverages are rich in calories and offer little nutrition. Physical activities are also essential management strategies to check blood sugar levels and other forms of cardiovascular disease [48]. Avoidance of alcohol and proper medication intake at the right time is also crucial management strategies that lead to the robust control of the disease. Furthermore, without coordination between doctors, nurses, and patients, diabetes management and treatment becomes impossible.

The government also worked at the local and national levels with the children's eating habits in the school. The government also incorporated incentives for healthy eating habits while taxing unhealthy foods. Restrictions on advertising for junk foods were also implemented so that children would not be fascinated with the advertisements. The government highly restricts reducing sodium or salt in packaged and processed foods because it benefits health. The approach is effective, equitable, and cost-effective, thus helping the population to negate diabetes, cardiovascular disease, and other health issues. The government also emphasizes using the right fats because it helps reduce complications among the people. The American Heart Association emphasizes using the right fats because it helps reduce complications among people. The FDA highly recommends the inclusion of Omega 3 daily to maintain balance and a healthy diet [49]. Therefore, these management strategies are highly effective and efficient in managing diabetes and heart disease due to unhealthy food habits.

11. Conclusion and Future Perspectives

From the above discussion, it is concluded that without appropriate management and treatment of diabetes, mortality rates worldwide. First, to eliminate diabetes,

we should treat obesity because it is one of the causes; this is done by restricting food intake using drugs or by undergoing the surgical process. This surgical process eliminates diabetes in a short period, and lack of physical activity causes diabetes, inheritance, or heredity, and lack of physical activities leads to increased complications among the sufferers. Appropriate treatment of the disease with medications, physical activities, and less intake of sweetened products helps sufferers avoid severe complications. The U.S. has been highly determined to control the spread of the disease, as it is weakening the economic stature of the company. However, the 2012 mortality rate scenario is quite different in the present era. Improvements in treatment and comprehensive government interventions to curb the disease have greatly reduced its severity. Therefore, healthy eating habits and ample physical activities with age would help limit the disease's severe fatality.

Conflicts of Interest

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

References

[1] Gurung, P., Zubair, M. and Jialal, I. (2024) Plasma Glucose. StatPearls Publishing.

[2] Hantzidiamantis, P.J., Awosika, A.O. and Lappin, S.L. (2024) Physiology, Glucose. StatPearls Publishing.

[3] Hitman, G.A. and Finer, S. (2011) Obesity and Type 2 Diabetes; Achieving Weight Loss. *Diabetic Medicine*, **28**, 627-627. https://doi.org/10.1111/j.1464-5491.2011.03319.x

[4] Deshmukh, C.D., and Jain, A., (2015) Diabetes Mellitus: A Review. *International Journal of Pure & Applied Bioscience*, **3**, 224-230.

[5] Asmat, U., Abad, K. and Ismail, K. (2016) Diabetes Mellitus and Oxidative Stress—A Concise Review. *Saudi Pharmaceutical Journal*, **24**, 547-553. https://doi.org/10.1016/j.jsps.2015.03.013

[6] Piché, M., Tchernof, A. and Després, J. (2020) Obesity Phenotypes, Diabetes, and Cardiovascular Diseases. *Circulation Research*, **126**, 1477-1500. https://doi.org/10.1161/circresaha.120.316101

[7] Algoblan, A., Alalfi, M. and Khan, M. (2014) Mechanism Linking Diabetes Mellitus and Obesity. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*, **7**, 587-591. https://doi.org/10.2147/dmso.s67400

[8] Nakamura, M. and Sadoshima, J. (2019) Cardiomyopathy in Obesity, Insulin Resistance and Diabetes. *The Journal of Physiology*, **598**, 2977-2993. https://doi.org/10.1113/jp276747

[9] Petersen, K.S., Maki, K.C., Calder, P.C., Belury, M.A., Messina, M., Kirkpatrick, C.F., *et al.* (2024) Perspective on the Health Effects of Unsaturated Fatty Acids and Commonly Consumed Plant Oils High in Unsaturated Fat. *British Journal of Nutrition*. https://doi.org/10.1017/s0007114524002459

[10] Samuel, P.O., Edo, G.I., Emakpor, O.L., Oloni, G.O., Ezekiel, G.O., Essaghah, A.E.A., *et al.* (2023) Lifestyle Modifications for Preventing and Managing Cardiovascular Diseases. *Sport Sciences for Health*, **20**, 23-36. https://doi.org/10.1007/s11332-023-01118-z

[11] Rosqvist, F. and Niinistö, S. (2024) Fats and Oils—A Scoping Review for Nordic

Nutrition Recommendations 2023. *Food & Nutrition Research*, **68**, Article 10487. https://doi.org/10.29219/fnr.v68.10487

[12] Hayes, K.C., Khosla, P., Hajri, T. and Pronczuk, A. (1997) Saturated Fatty Acids and LDL Receptor Modulation in Humans and Monkeys. *Prostaglandins, Leukotrienes and Essential Fatty Acids*, **57**, 411-418. https://doi.org/10.1016/s0952-3278(97)90420-8

[13] Pirahanchi, Y., Sinawe, H. and Dimri, M. (2023) Biochemistry, LDL Cholesterol. StatPearls Publishing.

[14] Bayram, S.Ş. and Kızıltan, G. (2024) The Role of Omega- 3 Polyunsaturated Fatty Acids in Diabetes Mellitus Management: A Narrative Review. *Current Nutrition Reports*, **13**, 527-551. https://doi.org/10.1007/s13668-024-00561-9

[15] Kenneth, R. (2024) The Effect of Diet on Cardiovascular Disease and Lipid and Lipoprotein Levels. Endotext.

[16] Gumus-Bonacina, C.E., Mcclements, D.J. and Decker, E.A. (2024) Replacing Animal Fats with Plant-Based Lipids: Challenges and Opportunities. *Current Opinion in Food Science*, **58**, Article 101193. https://doi.org/10.1016/j.cofs.2024.101193

[17] Shoaib, H., Naz, S., Panhwar, A., Khaskheli, A.R., Sidhu, A.R., Siyal, F.J., *et al.* (2024) Review on Health Concern: Trans Fatty Acids and Hydrogenation Process. *Biological Sciences-PJSIR*, **67**, 91-102.

[18] Thirumdas, R. (2022) Partial Hydrogenation of Oils Using Cold Plasma Technology and Its Effect on Lipid Oxidation. *Journal of Food Science and Technology*, **60**, 1674-1680. https://doi.org/10.1007/s13197-022-05434-z

[19] World Health Organization (2023) Countdown to 2023: WHO Report on Global Trans-fat Elimination 2022. World Health Organization.

[20] Mozaffarian, D. (2016) Dietary and Policy Priorities for Cardiovascular Disease, Diabetes, and Obesity: A Comprehensive Review. *Circulation*, **133**, 187-225. https://doi.org/10.1161/circulationaha.115.018585

[21] Micha, R., Peñalvo, J.L., Cudhea, F., Imamura, F., Rehm, C.D. and Mozaffarian, D. (2017) Association between Dietary Factors and Mortality from Heart Disease, Stroke, and Type 2 Diabetes in the United States. *JAMA*, **317**, 912-924. https://doi.org/10.1001/jama.2017.0947

[22] Shan, Z., Wang, F., Li, Y., Baden, M.Y., Bhupathiraju, S.N., Wang, D.D., *et al.* (2023) Healthy Eating Patterns and Risk of Total and Cause-Specific Mortality. *JAMA Internal Medicine*, **183**, 142-153. https://doi.org/10.1001/jamainternmed.2022.6117

[23] Lotfy, M., Adeghate, J., Kalasz, H., Singh, J. and Adeghate, E. (2016) Chronic Complications of Diabetes Mellitus: A Mini Review. *Current Diabetes Reviews*, **13**, 3-10. https://doi.org/10.2174/1573399812666151016101622

[24] Devereux, R.B., Roman, M.J., Paranicas, M., O'Grady, M.J., Lee, E.T., Welty, T.K., *et al.* (2000) Impact of Diabetes on Cardiac Structure and Function: The Strong Heart Study. *Circulation*, **101**, 2271-2276. https://doi.org/10.1161/01.cir.101.19.2271

[25] Craig, L., Sims, R., Glasziou, P. and Thomas, R. (2020) Women's Experiences of a Diagnosis of Gestational Diabetes Mellitus: A Systematic Review. *BMC Pregnancy and Childbirth*, **20**, Article No. 76. https://doi.org/10.1186/s12884-020-2745-1

[26] Choudhury, H., Pandey, M., Hua, C.K., Mun, C.S., Jing, J.K., Kong, L., *et al.* (2018) An Update on Natural Compounds in the Remedy of Diabetes Mellitus: A Systematic Review. *Journal of Traditional and Complementary Medicine*, **8**, 361-376. https://doi.org/10.1016/j.jtcme.2017.08.012

[27] Jafari, N., Alivand, S., Molaee, H., Shahabi Rabori, V., Asadian, A., Abbasian, S., *et al.*

(2023) How Lifestyle Factors Can Contribute to Cardiovascular Disease Incidence: A Review Study. *Journal of Preventive Epidemiology*, **9**, e35232. https://doi.org/10.34172/jpe.2023.35232

[28] Oja, P. and Titze, S. (2011) Physical Activity Recommendations for Public Health: Development and Policy Context. *EPMA Journal*, **2**, 253-259. https://doi.org/10.1007/s13167-011-0090-1

[29] Day, A.R. and Robert-McComb, J.J. (2023) Screening for Safe Exercise Participation and Exercise Guidelines for Health-Related Fitness. In: Robert-McComb, J.J., Zumwalt, M. and Fernandez-del-Valle, M., Eds., *The Active Female: Health Issues throughout the Lifespan*, Springer International Publishing, 427-450. https://doi.org/10.1007/978-3-031-15485-0_24

[30] Fyffe, A., Orr, R., Cassimatis, M. and Browne, G. (2024) Children and Exercise. *Australian Journal of General Practice*, **53**, 109-115. https://doi.org/10.31128/ajgp-05-23-6849

[31] Foretz, M., Guigas, B. and Viollet, B. (2023) Metformin: Update on Mechanisms of Action and Repurposing Potential. *Nature Reviews Endocrinology*, **19**, 460-476. https://doi.org/10.1038/s41574-023-00833-4

[32] Sahin, I., Bakiner, O., Demir, T., Sari, R. and Atmaca, A. (2024) Current Position of Gliclazide and Sulfonylureas in the Contemporary Treatment Paradigm for Type 2 Diabetes: A Scoping Review. *Diabetes Therapy*, **15**, 1687-1716. https://doi.org/10.1007/s13300-024-01612-8

[33] Lin, W., Liu, K., Ling, T., Wang, M. and Lin, W. (2023) Role of Antidiabetic Agents in Type 2 Diabetes Patients with Chronic Kidney Disease. *World Journal of Diabetes*, **14**, 352-363. https://doi.org/10.4239/wjd.v14.i4.352

[34] Singh, G., Kumar, R., D.S., D., Chaudhary, M., Kaur, C. and Khurrana, N. (2024) Thiazolidinedione as a Promising Medicinal Scaffold for the Treatment of Type 2 Diabetes. *Current Diabetes Reviews*, **20**, 89-109. https://doi.org/10.2174/0115733998254798231005095627

[35] Lu, H., Xie, T., Wu, Q., Hu, Z., Luo, Y. and Luo, F. (2023) Alpha-Glucosidase Inhibitory Peptides: Sources, Preparations, Identifications, and Action Mechanisms. *Nutrients*, **15**, Article 4267. https://doi.org/10.3390/nu15194267

[36] Saini, K., Sharma, S. and Khan, Y. (2023) DPP-4 Inhibitors for Treating T2DM—Hype or Hope? An Analysis Based on the Current Literature. *Frontiers in Molecular Biosciences*, **10**, Article 1130625. https://doi.org/10.3389/fmolb.2023.1130625

[37] Fu, E.L., Wexler, D.J., Cromer, S.J., Bykov, K., Paik, J.M. and Patorno, E. (2024) SGLT-2 Inhibitors, GLP-1 Receptor Agonists, and DPP-4 Inhibitors and Risk of Hyperkalemia among People with Type 2 Diabetes in Clinical Practice: Population Based Cohort Study. *BMJ*, **385**, e078483. https://doi.org/10.1136/bmj-2023-078483

[38] Neves, J.S., Borges-Canha, M., Vasques-Nóvoa, F., Green, J.B., Leiter, L.A., Granger, C.B., *et al.* (2023) GLP-1 Receptor Agonist Therapy with and without SGLT2 Inhibitors in Patients with Type 2 Diabetes. *Journal of the American College of Cardiology*, **82**, 517-525. https://doi.org/10.1016/j.jacc.2023.05.048

[39] Eržen, S., Tonin, G., Jurišić Eržen, D. and Klen, J. (2024) Amylin, Another Important Neuroendocrine Hormone for the Treatment of Diabesity. *International Journal of Molecular Sciences*, **25**, Article 1517. https://doi.org/10.3390/ijms25031517

[40] Sami, W., Ansari, T., Butt, N.S. and Ab Hamid, M.R. (2017) Effect of Diet on Type 2 Diabetes Mellitus: A Review. *International Journal of Health Sciences*, **11**, 65-71.

[41] Micha, R., Shulkin, M.L., Peñalvo, J.L., Khatibzadeh, S., Singh, G.M., Rao, M., *et al.* (2017) Etiologic Effects and Optimal Intakes of Foods and Nutrients for Risk of

Cardiovascular Diseases and Diabetes: Systematic Reviews and Meta-Analyses from the Nutrition and Chronic Diseases Expert Group (Nutricode). *PLOS ONE*, **12**, e0175149. https://doi.org/10.1371/journal.pone.0175149

[42] Yuan, S., Li, X., Jin, Y. and Lu, J. (2017) Chocolate Consumption and Risk of Coronary Heart Disease, Stroke, and Diabetes: A Meta-Analysis of Prospective Studies. *Nutrients*, **9**, Article 688. https://doi.org/10.3390/nu9070688

[43] Helle, E. and Priest, J.R. (2020) Maternal Obesity and Diabetes Mellitus as Risk Factors for Congenital Heart Disease in the Offspring. *Journal of the American Heart Association*, **9**, e011541. https://doi.org/10.1161/jaha.119.011541

[44] Farooqi, I.S. (2024) Genetics of Obesity. In: Holt, R.I.G., Cockram, C., Flyvbjerg, A. and Goldstein, B.J., Eds., *Textbook of Diabetes*, John Wiley & Sons Ltd., 197-202.

[45] Chandrasekaran, P. and Weiskirchen, R. (2024) The Role of Obesity in Type 2 Diabetes Mellitus—An Overview. *International Journal of Molecular Sciences*, **25**, Article 1882. https://doi.org/10.3390/ijms25031882

[46] Lee, K.W., Ching, S.M., Ramachandran, V., Yee, A., Hoo, F.K., Chia, Y.C., *et al.* (2018) Prevalence and Risk Factors of Gestational Diabetes Mellitus in Asia: A Systematic Review and Meta-Analysis. *BMC Pregnancy and Childbirth*, **18**, Article No. 494. https://doi.org/10.1186/s12884-018-2131-4

[47] Alexander, D.D., Miller, P.E., Vargas, A.J., Weed, D.L. and Cohen, S.S. (2016) Meta-Analysis of Egg Consumption and Risk of Coronary Heart Disease and Stroke. *Journal of the American College of Nutrition*, **35**, 704-716. https://doi.org/10.1080/07315724.2016.1152928

[48] Gomes, J.M.G., de Assis Costa, J. and de Cássia Gonçalves Alfenas, R. (2017) Metabolic Endotoxemia and Diabetes Mellitus: A Systematic Review. *Metabolism*, **68**, 133-144. https://doi.org/10.1016/j.metabol.2016.12.009

[49] Stanhiser, J., Jukic, A.M.Z., McConnaughey, D.R. and Steiner, A.Z. (2022) Omega-3 Fatty Acid Supplementation and Fecundability. *Human Reproduction*, **37**, 1037-1046. https://doi.org/10.1093/humrep/deac027