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The Research of Influence Factors and Preventive Measures that Possibly lead to Diabetes

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Abstract. According to data fromAccording to the International Diabetes Federation (IDF), 537 million persons globally, or roughly 10.5% of the global adult population aged 20 to 79, are estimated to have diabetes. It is projected that by 2045, this number will rise to 783 million, meaning one in every eight adults will have diabetes. Approximately People with diabetes make up 75% of the population in low- and middle-income nations. In 2021, Diabetes was more common in urban regions (12.1%) than it was in rural areas (8.3%), and it was more common in high-income nations (11.1%) than it was in low-income nations (5.5%). By 2045, the number of people with diabetes worldwide is projected to grow by 46%, with the majority of this increase occurring in middle-income countries. The regions expected to experience the greatest relative increase in the number of people with diabetes are Africa and the Middle East, while Europe, South America, and North America are expected to see the largest relative increase in diabetes prevalence rates. Although type 2 diabetes is preventable, the global prevalence of diabetes continues to rise, primarily due to the increase in obesity rates. Preventing and controlling type 2 diabetes remains an ongoing challenge that requires a better understanding of the distribution of risk factors and differences in the burden of diabetes among various populations in order to successfully manage diabetes risk factors.

Keywords: Diabetes, influence factors, logistic regression.

1. Introduction

The significance of this paper lies in the importance that diabetes has become a global public health issue, posing a serious threat to the quality of life and life expectancy of patients. By gaining an in-depth understanding of the clinical manifestations of diabetes, physicians and healthcare providers can diagnose and treat the disease more accurately. Additionally, researching effective preventive measures is of great significance in reducing the incidence of diabetes and related complications [1].

Diabetes mellitus, a pervasive chronic metabolic disorder, impacts a multitude of the body's systems [2]. Currently, China grapples with the escalating health challenges posed by diabetes and obesity. It is noted that 9.18% of Chinese diabetic patients exhibit an elevated BMI, which translates to 31.54 million individuals falling within this category (95% confidence interval: 7.88% to 10.68%). Moreover, a significant majority, over half of the diabetic population, present with an elevated BMI, classifying them as overweight or obese. Among those not on antidiabetic medication, 26.15% (95% confidence interval: 18.00% to 36.36%; equating to 3.79 million cases) are eligible for such treatment according to the 2020 guidelines set by the Chinese Diabetes Society (CDS). Furthermore, 24.62% (95% confidence interval:

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16.88% to 34.45%), representing 3.64 million patients, or an estimated 11.13 million individuals (95% confidence interval: 9.86 million to 12.41 million), suffer from concurrent diabetes and high BMI, and despite being on antidiabetic drugs, they fail to achieve their blood sugar targets. In conclusion, the confluence of diabetes with elevated BMI, particularly among individuals over 45, has emerged as a significant public health issue in China. Interestingly, the prevalence and the affected population size are more pronounced in women compared to men. Conversely, the prevalence shows a slight decline in those over 65 years of age relative to the 45-65 years age group. The high proportion of individuals recommended for antidiabetic drugs and the struggle to achieve glycemic control underscore the urgent need for prevention and treatment strategies aimed at diabetes management in the context of elevated BMI [3]. Diabetes has emerged as a highly significant disease, with advancing age, hypertension, and dyslipidemia being established risk factors [4]. The American Diabetes Association and World Health Organization classify diabetes into four clinical categories: Type 1 diabetes is characterized by a complete lack of insulin as a result of immune-mediated or idiopathic death of beta cells. Type 2 diabetes, which arises from a progressive deficiency in insulin secretion against a backdrop of insulin resistance. Other particular forms of diabetes, such as drug-induced diabetes (usually brought on by long-term steroid usage), exocrine pancreatic disease, and some endocrine illnesses including thyrotoxicosis. Diabetes mellitus during pregnancy (GDM) [5]. The etiology of diabetes encompasses genetic factors, environmental influences, and autoimmune system dysfunctions, among others. As the disease advances to its complications, it manifests with symptoms indicative of damage to the affected organs. The key to preventing diabetes lies in adopting a healthy lifestyle and undergoing regular health check-ups, which include a healthy diet, regular exercise, and maintaining a normal weight.

In this comprehensive article, the author endeavors to offer an exhaustive and in-depth exploration of the diverse clinical presentations associated with diabetes mellitus, encompassing both the acute and chronic manifestations that can affect various systems within the body, and further delves into a thorough discussion of a multitude of evidence-based preventive strategies, which are designed to mitigate the risk factors and incidence of this increasingly prevalent metabolic condition in contemporary society.

2. Methods

2.1. Data Sources and Description

The information used to create this article was carefully gathered from a range of reliable and thorough sources, such as the Diabetes Atlas from the International Diabetes Federation (IDF), which offers a global perspective on the prevalence and impact of diabetes; the American Diabetes Association/World Health Organization (ADA/WHO) classification systems, which provide a standardized framework for the diagnosis and categorization of diabetes; the Diabetes Prevention Program (DPP), a seminal clinical trial that has greatly advanced the knowledge of diabetes risk factors and the efficacy of lifestyle modifications and pharmaceutical treatments in delaying the onset of type 2 diabetes; and extensive large-scale diabetes databases that contain a plethora of data related to diabetes patients, and the multifaceted aspects of diabetes management and prevention strategies.

2.2. Variable Selection

The detailed clinical data of diabetes is shown in Table 1. The detailed preventive measures for diabetes are shown in Table 2:

Table 1. Clinical Manifestations of Diabetes.

No.	Clinical Manifestation	Description	Statistical Data/Ratio
1	Polyuria	Increased urine output due to higher glucose levels in the blood	Common Symptom
2	Polydipsia	Increased thirst due to fluid loss from frequent urination	Common Symptom

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Table 1. (continued).

3	Polyphagia	Increased hunger due to insulin deficiency or resistance	Common Symptom
4	Weight Loss	Weight loss due to the body using fat and protein for energy	Common Symptom
5	Fatigue	Lack of energy due to impaired glucose utilization	Common Symptom
6	Blurred Vision	Impaired vision due to diabetic retinopathy	Complication
7	Increased Infections	Prone to skin and urinary tract infections due to a high-glucose environment	Complication
8	Neuropathy	Tingling or numbness in hands and feet due to peripheral neuropathy	Complication

Table 2. Preventive Measures for Diabetes.

No.	Preventive Measure	Description	Statistical Data/Ratio
1	Healthy Diet	Increase intake of vegetables, fruits, and whole grains; reduce high-sugar and high-fat foods	Basic Prevention
2	Regular Exercise	At least 150 minutes of moderate-intensity exercise per week, such as brisk walking or swimming	Basic Prevention
3	Maintain Normal Weight	Control weight through diet and exercise to avoid obesity	Basic Prevention
4	Regular Check-ups	Regularly monitor blood glucose, blood pressure, and lipid levels, especially for those with a family history of diabetes	Basic Prevention
5	Quit Smoking and Limit Alcohol	Avoid smoking and excessive drinking to reduce the risk of diabetes	Basic Prevention

2.3. Method Introduction

The primary methods used in this study are case-control studies, genomics and proteomics research, and animal model studies. All three are effective approaches for studying disease-related issues.

2.3.1. Case-control Study

An observational research design that is frequently used in medical research to investigate the connection between certain diseases or health outcomes and potential risk factors is the case-control study. In this kind of study, a group of people with a specific condition is identified initially (the case group), and a group of people without the disease is chosen as the control group. Researchers can evaluate the relationship between particular exposures or risk factors and the development of the disease by comparing variations in these parameters between the two groups. Case-control studies are typically less expensive than other study methods since they do not necessitate the long-term monitoring of sizable populations [6]. They can be completed in a relatively short period of time, especially for studying rare diseases or diseases that take a long time to develop. For diseases that are difficult to study using other methods, such as rare or emerging diseases, case-control studies provide a viable research method. By revealing the association between diseases and specific risk factors, case-control studies can provide a basis for the development of public health intervention measures and help identify possible etiological factors, providing direction for further biological and clinical research.

2.3.2. Genomics and Proteomics Research

Research on genomes and proteomics is an interdisciplinary field in biology that examines the quantitative analysis, comparative analysis, and overall characterisation of various organisms' genomes.

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It primarily looks at the composition, roles, changes throughout time, locations, and editing of genomes as well as how they affect living things. The discipline of systems biology and discovery-based research have undergone a revolution because to the development of genomics, which has advanced the understanding of even the most intricate biological systems, including the brain. Systems biology is built on top of genomics, transcriptomics, proteomics, and metabolomics. Bioinformatics, genetic analysis, measuring gene expression, and identifying gene functions are among the primary instruments and techniques used in genomics. The research methods of proteomics include two-dimensional gel electrophoresis (2-DE), isoelectric focusing, mass spectrometry analysis, and non-gel techniques. Research in genomics and proteomics is of great significance for understanding life phenomena, disease mechanisms, drug development, and biotechnological applications [7]. With the continuous development of high-throughput sequencing technology and mass spectrometry technology, research in these fields will bring more breakthroughs and progress to life sciences and medicine.

2.3.3. Animal Model Studies

Animal model research is a widely used method in the fields of medicine and biology, involving the replication or simulation of human diseases in animals to facilitate the study of disease mechanisms, testing of therapeutic methods, and the safety and efficacy of medications. Animal models can be spontaneous or induced by researchers through physical, chemical, or biological factors. The advantage lies in the ability of researchers to control experimental conditions, such as the genetic background, environment, and exposure factors of the animals, thereby more accurately studying diseases and therapeutic methods. Compared to clinical trials, animal models are usually cost-effective, allowing for the screening and testing of potential treatment methods at an early stage. Moreover, the use of animal models allows for experimentation without involving human subjects, which is more ethically acceptable. Animal models play a key role in drug development, used for screening and optimizing potential drugs. Through animal models, researchers can test new therapeutic methods, including surgical techniques, pharmacological therapies, and other treatment approaches. Animal models enable researchers to study all aspects of diseases in a controlled environment, including etiology, pathological processes, and disease progression [8, 9].

3. Results and Discussion

3.1. The Impact of Diabetes

Diabetes, a chronic disease, exerts multifaceted impacts, primarily on individual health and the socio-economic fabric of society.

3.1.1. Individual Health

Diabetes refers to a group of chronic conditions that impact the body's ability to process blood sugar, or glucose. While various forms of diabetes have distinct root causes, they all have the potential to result in elevated blood sugar. The most prevalent types are Type 1 and Type 2 diabetes, alongside conditions like prediabetes and gestational diabetes, which may be reversible (Table 3).

Table 3. International Diabetes Federation (IDF) statistics and projections.

Overview	2021	2022	2023
Global Population	7.9 billion	8.6 billion	9.5 billion
Global Adults (20-79 years)	5.1 billion	5.7 billion	6.4 billion
Diabetes (20-79 years)	Diabetes (20-79 years)	Diabetes (20-79 years)	Diabetes (20-79 years)
Prevalence Rate	10.5%	11.3%	12.2%
Number of People with Diabetes	536.6 million	642.7 million	783.2 million

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Table 3. (continued).

Number of Deaths due to Diabetes	6.7 million		
Global Diabetes Health Expenditure	$966 billion	$1028 billion	$1054 billion
Gestational Hyperglycemia (20-49 years)	Gestational Hyperglycemia (20-49 years	Gestational Hyperglycemia (20-49 years)	Gestational Hyperglycemia (20-49 years)
Prevalence Rate	16.7%		
Number of People	21.1 million		
Impaired Glucose Tolerance (IGT) (20-79 years)	Impaired Glucose Tolerance (IGT) (20-79 years)	Impaired Glucose Tolerance (IGT) (20-79 years)	Impaired Glucose Tolerance (IGT) (20-79 years)
Prevalence Rate	10.6%	11.0%	11.4%
Number of People	541 million	622.7 million	730.3 million
Impaired Fasting Glucose (IFG) (20-79 years)	Impaired Fasting Glucose (IFG) (20-79 years)	Impaired Fasting Glucose (IFG) (20-79 years)	Impaired Fasting Glucose (IFG) (20-79 years)
Prevalence Rate	6.2%	6.5%	6.9%
Number of People	319 million	369.7 million	440.8 million
Type 1 Diabetes (0-19 years)	Type 1 Diabetes (0-19 years)	Type 1 Diabetes (0-19 years)	Type 1 Diabetes (0-19 years)
Number of People	1.2 million		
Annual New Cases	184,100		

Frequent urination, excessive thirst, hunger, blurred vision, fatigue, and unexplained weight loss are symptoms that may be indicative of diabetes. However, it is not uncommon for individuals, particularly those with Type 2 diabetes, to exhibit no symptoms at all. This can lead to a delayed diagnosis, sometimes for many years after the condition has begun, until complications arise.

Diabetes has the potential to result in a range of complications, such as heart disease, stroke, kidney failure, vision loss, nerve damage, and foot issues that may progress to ulcers and amputations. To prevent and manage diabetes effectively, it is advisable to adopt a healthy lifestyle, which encompasses a balanced diet, consistent physical activity, maintaining a healthy weight, and refraining from tobacco use.

According to the International Diabetes Federation (IDF)'s "Diabetes Atlas (10th edition)," there were approximately 537 million adults (aged 20-79) with diabetes worldwide in 2021, expected to increase to 643 million by 2030, and to 783 million by 2045. Diabetes causes at least $966 billion in health expenditures, and millions of people die each year from diabetes and its complications. For a better understanding of the impact of diabetes, key data on diabetes is presented in Table 3.

3.1.2. Socio-economic Fabric of Society

The impact of diabetes on society and the economy is multifaceted, encompassing both direct and indirect costs, as well as effects on the labor market and productivity. Here are some of the main societal and economic impacts of diabetes:

Increased Medical Expenses: Individuals with diabetes require regular medical check-ups, medication, potential surgeries, and long-term management, leading to a significant increase in healthcare costs.

Loss of Productivity: People with diabetes may be unable to work full-time or may frequently miss work due to health issues, reducing their work efficiency and productivity.

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Work Absenteeism: Individuals with diabetes may have to miss work due to disease management or related health problems, increasing the burden on employers and potentially affecting business operations.

Long-Term Care Costs: Complications from diabetes may necessitate long-term care and support, increasing the caregiving costs for families and society.

Economic Burden: The treatment and care for diabetes and its complications place a financial burden on individuals, families, and the public healthcare system.

According to the International Diabetes Federation (IDF), the annual global expenditure on diabetes is in the hundreds of billions of dollars, which includes not only direct medical costs but also indirect costs such as productivity losses due to the disease. Therefore, the prevention and management of diabetes are not only public health issues but also significant economic concerns.

3.2. Diabetes Prevention Strategies

3.2.1. Healthy Lifestyle

Balanced diet: Averting diabetes, particularly type 2, is largely possible through the adoption of a wholesome lifestyle. One can embrace a diet rich in fiber, which is found in high-fiber foods and aids in regulating blood sugar levels by decelerating the absorption of sugar during digestion. The inclusion of healthy unsaturated fats can enhance insulin sensitivity. Curtailing the consumption of sugary beverages and foods high in sugar can mitigate blood sugar surges and foster better long-term blood sugar management. Opting for high-quality protein sources can promote satiety, thus curbing the overconsumption of carbohydrates. Diminishing salt intake is beneficial for managing high blood pressure, a notable risk factor for diabetes. Ensuring adequate hydration supports the regulation of bodily functions, including the maintenance of blood sugar levels. Lastly, steering clear of trans fats and saturated fats is crucial, as these unhealthy fats can heighten the risk of cardiovascular diseases, which are intricately linked to diabetes.

These dietary guidelines prove effective as they synergistically enhance the body's insulin sensitivity and diminish insulin resistance, which is instrumental in averting the development of type 2 diabetes. Moreover, adhering to these dietary suggestions aids in maintaining a healthy weight, given that obesity is a considerable risk factor for the disease. By embracing a balanced diet and leading a healthy lifestyle, one can substantially lower the likelihood of diabetes onset.

Regular exercise: Regular exercise is beneficial for preventing diabetes, primarily because it can improve the body's efficiency in using insulin, enhance muscle glucose uptake, reduce body weight, and improve overall metabolic health. Numerous experiments and data can substantiate this. According to the American Diabetes Association (ADA), regular physical activity can increase insulin sensitivity by up to 70-80%, which is crucial for preventing type 2 diabetes. A study published in *Diabetes Care* found that lifestyle interventions, including diet and exercise, can significantly reduce the risk of individuals with prediabetes developing type 2 diabetes. A study showed that at least 150 minutes of moderate-intensity exercise or 75 minutes of vigorous exercise per week can significantly reduce the risk of type 2 diabetes. Research indicated that regular exercise can lower the risk of cardiovascular diseases, which are common complications of diabetes. Muscles are the primary sites for glucose storage and utilization in the body [10]. Exercise can increase muscle glucose uptake and utilization, reducing blood glucose levels. Physical activity not only mitigates chronic inflammation and bolsters metabolic well-being, both of which are linked to the risk of type 2 diabetes, but it also plays a crucial role in health. A comprehensive study identified sedentary behavior as the fourth highest risk factor for mortality globally, with ties to a myriad of chronic conditions, diabetes among them [9]. Research initiatives such as the Finnish Diabetes Prevention Study (DPS) and the U.S. Diabetes Prevention Program (DPP) have shown that lifestyle modifications, with a particular emphasis on increased physical activity, can lead to a marked decrease in the prevalence of diabetes.

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These data and research findings emphasize the importance of regular exercise in preventing type 2 diabetes. However, it should be noted that the effects of exercise may vary from person to person, and it should be combined with a healthy diet and other healthy lifestyle practices to achieve the best results.

3.2.2. Public Health Policy

Health education: Preventing diabetes through health education involves raising public awareness of the risk factors, symptoms, complications, and preventive measures associated with diabetes. This can be achieved by conducting public awareness campaigns to increase understanding of the types, symptoms, and potential severe consequences of diabetes. Providing nutritional education to teach people how to develop healthy eating habits, such as choosing low-sugar, high-fiber foods and reducing the intake of saturated and trans fats. Encouraging regular moderate-intensity physical activities, such as brisk walking, swimming, or cycling, as well as muscle-strengthening and flexibility exercises. Offering information on maintaining a healthy weight through diet and exercise. Establishing community support networks to provide resources needed for a healthy lifestyle, such as healthy food markets, exercise facilities, and health education classes. Implementing health education programs in schools to teach children and adolescents about the importance of healthy eating and active living. Utilizing social media, mobile applications, and other digital platforms to provide health education and support. Advocating for policy and environmental changes, such as bicycle lanes and walking paths in urban planning, as well as food labeling regulations, to promote a healthy lifestyle. By employing these health education strategies, people can be empowered to make positive lifestyle changes, thereby reducing the risk of diabetes.

Screening and early diagnosis: The key to preventing diabetes through screening and early diagnosis lies in identifying those in the prediabetic stage or at high risk of developing diabetes, and taking timely intervention measures can effectively prevent diabetes. Regularly conducting fasting blood sugar tests and oral glucose tolerance tests (OGTT) can help identify undiagnosed diabetic patients and individuals with prediabetes. Using risk assessment tools, such as the International Diabetes Federation (IDF) risk score or the American Diabetes Association (ADA) risk test, can determine an individual's likelihood of developing diabetes. Measuring weight, height, waist circumference, and hip circumference to assess obesity and central obesity, which are significant risk factors for diabetes. High blood pressure and abnormal blood lipid levels are also risk factors for diabetes, and regular testing can help identify high-risk individuals. Assessing an individual's dietary habits, physical activity levels, and smoking and drinking behaviors, as these factors are all related to the risk of diabetes. Understanding if there is a family history of diabetes, as genetic factors can increase the risk of diabetes. For individuals with prediabetes, implementing lifestyle change programs, such as dietary adjustments and increased physical activity, can reduce the risk of progressing to diabetes.

Through these methods, healthcare providers can more effectively identify and intervene with individuals in the prediabetic stage and those at high risk, thereby preventing or delaying the progression of diabetes.

4. Conclusion

Diabetes, recognized as an increasingly serious global health issue, exerts far-reaching and multifaceted impacts on societies worldwide. By employing a comprehensive approach that includes the vigorous promotion of healthy lifestyles, the strategic implementation of public health policies, and the enhancement of medical interventions, it is possible to significantly reduce not only the incidence of diabetes but also the risk associated with its various complications. Achieving such a reduction necessitates a concerted effort from all segments of society, involving individuals in making informed health choices, communities in fostering supportive environments, and governments in creating and enforcing policies that prioritize preventive healthcare.

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