ETIOLOGY, PATHOGENESIS, AND CAUSES OF DEVELOPMENT OF DIABETES MELLITUS

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Abstract: *The article discusses the etiology, causes of development, prevalence, types, clinical manifestations, effects on the body's functioning, and consequences of diabetes mellitus.*

Keywords: *Diabetic coma, insulin, glycosuria, beta cells, autoimmune diseases, stress, blood sugar levels.*

Objective: To enhance medical knowledge about diabetes mellitus and its etiology.

Relevance of the Topic: Diabetes mellitus is a widespread and serious disease that has been increasing globally year by year. According to the World Health Organization, in 2021, the number of people with diabetes worldwide reached 537 million. Statistics suggest that by 2045, the number of people with diabetes could reach 783 million. Diabetes was responsible for 6.7 million deaths in 2021.

Diabetes occurs approximately equally among men and women, but in some regions, it is more prevalent among men. For example, in 2022, nearly 37 million people in the USA were living with diabetes, which constitutes about 11.3% of the total population. In Europe, the number of people with diabetes reached 61 million in 2021. In Asia, particularly in India and China, the number of people with diabetes is very high. In China, 141 million people had diabetes in 2021, and in India, 74 million people were affected. These data show that diabetes mellitus is one of the most widespread chronic diseases that poses a significant

risk to human life, and studying and analyzing its causes, clinical progression, symptoms, and consequences is of utmost importance.

Diabetes poses a substantial burden on the global health system, requiring serious measures to reduce its prevalence. Prevention, promotion of a healthy lifestyle, increased availability of medical care, and early detection of the disease should be addressed. The causes of diabetes differ based on its type. Both types have specific causes. In type 1 diabetes, the body's immune system mistakenly attacks and destroys insulin-producing beta cells. This process is called an autoimmune reaction. The exact causes are not fully understood, but several factors may contribute to this. For instance, genetic factors: a family history of type 1 diabetes increases the risk of developing the disease; environmental factors: certain viral infections may trigger the development of type 1 diabetes; and immune system disorders: improper functioning of the immune system can lead to autoimmune attacks.

Type 2 Diabetes Causes: Type 2 diabetes typically develops due to insulin resistance and decreased insulin production in the body. The following factors can contribute to the development of this type of diabetes:

Genetic Factors: If type 2 diabetes is present in the family, the risk of developing this disease increases. Excess weight and obesity, as well as increased fat tissue, enhance insulin resistance in the body. Additionally, physical inactivity and lack of exercise lead to increased blood sugar levels and insulin resistance. Furthermore, unhealthy eating habits, such as consuming large amounts of sugar and fatty foods, also increase the risk of diabetes.

Age-Related Factors: Type 2 diabetes has age-related characteristics, with the risk of developing diabetes increasing with age. Certain hormonal disorders (e.g., Cushing's syndrome) can also cause diabetes. Stress and worsening mental health may contribute to the development of type 2 diabetes.

Many factors that cause the development of type 2 diabetes are interconnected and can deteriorate overall health. Therefore, adopting a healthy

lifestyle, engaging in regular physical activity, proper nutrition, and managing stress are crucial measures for preventing type 2 diabetes.

Researchers have been studying the genetic factors related to type 2 diabetes. It is often found that type 2 diabetes occurs more frequently when there is a family history of the disease. Genetic research has identified numerous genetic markers associated with diabetes development. Poor dietary habits and excess weight can contribute to the development of type 2 diabetes. Studies have shown that consuming large amounts of sugary and fatty foods increases the risk of diabetes. Therefore, a balanced and healthy diet is a key factor in preventing diabetes.

Physical Activity: Physical activity plays a significant role in preventing and managing diabetes. Research has shown that physical activity can improve insulin sensitivity and lower blood sugar levels. Thus, regular exercise is an effective method for combating diabetes.

Stress: Stress can also impact the development of type 2 diabetes. Stress leads to hormonal changes, which can increase insulin resistance. Studies have indicated that stress management techniques (e.g., meditation, yoga) may be beneficial for patients with diabetes.

Pharmacological Treatment: Numerous studies have been conducted on pharmacological treatments for diabetes. For example, medications like metformin and insulin are widely used for managing diabetes. Additionally, research continues on new drugs and insulin substitutes.

Low-Carbohydrate Diets: Low-carbohydrate diets can be effective in managing diabetes. Research has shown that such diets help reduce blood sugar levels and assist in weight loss.

Prevention Programs: Prevention programs for diabetes have been developed. For example, the Diabetes Prevention Program (DPP) in the United States has been effective in preventing diabetes in individuals at high risk of developing the disease. This program emphasizes promoting a healthy lifestyle and monitoring blood sugar levels.

Epigenetics Research: Recent studies in the field of epigenetics have shown that, beyond genetics, epigenetic factors also play a significant role in the development of diabetes. Epigenetic changes, influenced by environmental factors, can alter gene expression. These studies are crucial for understanding, preventing, and treating diabetes, providing new opportunities for combating the disease.

Conclusion

Type 2 diabetes is a complex and prevalent condition influenced by a variety of factors including genetics, lifestyle, and environmental conditions. The development of type 2 diabetes is primarily driven by insulin resistance and reduced insulin production, which are exacerbated by genetic predisposition, obesity, physical inactivity, unhealthy dietary habits, and age-related changes. Stress and hormonal imbalances also contribute significantly to the disease's onset.

Effective prevention and management of type 2 diabetes require a multifaceted approach. Adopting a healthy lifestyle, which includes regular physical activity, balanced nutrition, and stress management, is crucial in reducing the risk and controlling the progression of the disease. Advances in pharmacological treatments and research into new medications continue to provide valuable tools for managing diabetes.

Prevention programs like the Diabetes Prevention Program (DPP) have proven successful in reducing diabetes risk in high-risk individuals, highlighting the importance of early intervention and lifestyle modification. Additionally, emerging research in epigenetics offers promising insights into how environmental factors can influence diabetes risk, potentially leading to new strategies for prevention and treatment.

Overall, a comprehensive approach involving lifestyle changes, medical interventions, and ongoing research is essential for tackling the growing global challenge of type 2 diabetes and improving the quality of life for those affected by this chronic condition.

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