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The physiological and biochemical effects of diabetes on the body

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Abstract

Diabetes damages and disables many parts of the body. All components of the cardiovascular system are susceptible to harm from high blood sugar levels. Diabetes and cardiovascular issues are closely related because of this. Blood flow is impeded by the narrowing and loss of flexibility of blood vessels brought on by high blood sugar levels. Due to the decreased blood and oxygen delivery, there is an increased risk of high blood pressure and injury to both large and tiny blood vessels. Among the complications of macrovascular disease are: cardiac arrest stroke, disease of the peripheral arteries. Microvascular disease may also result in issues with the following: eyes, kidneys, neurous system. When there is a wound or infection, poor circulation hinders the body's capacity to heal. This is brought on by a lack of nutrition, oxygen, and blood. A diabetic patient should constantly examine their skin for wounds and visit their doctor if they exhibit any symptoms of an infection, such as redness, swelling, or fever. Diabetic complications are frequently accompanied by neuropathy, or nerve damage. Nerve damage affects 10 to 20 percent of persons with diabetes at first diagnosis. A person has a greater risk of developing neuropathy the longer they have diabetes. Small wounds may be harder to detect due to the neuropathy-related lack of sensation. This might cause serious issues when coupled with poor circulation. For instance, an infection can swiftly worsen if a person ignores a blister on their foot. It's a result of poor circulation. Amputation might be required in some instances due to the possibility of tissue death and ulceration.

Keywords: Type 2 diabetes mellitus; Cardiovascular disease; Insulin resistance; Azerbaijan

1. Introduction

Type 2 diabetes mellitus (DMII) is the most common type of diabetes, accounting for approximately 90-95% of all diabetics. It is linked to changes in glucose, lipid, and protein metabolism. Chronic hyperglycemia can cause organ malfunction and failure, particularly in the eyes, kidneys, nerves, heart, and blood vessels. Retinopathy, nephropathy, neuropathy, myocardial infarction, and stroke are among the long-term micro- and macrovascular consequences of DMII [1,2]. According to the American Diabetes Association, cardiovascular disease (CVD) accounts for 75-80% of DMII mortality [3]. DMII anomalies are caused by a lack of insulin effect on target tissues as a result of impaired insulin production, errors in insulin action, or both. Insulin resistance, defined as a diminished physiological response of peripheral tissues to the action of normal levels of insulin, is a common finding in a variety of metabolic illnesses, including DMII and MetaS [4,5,6]. Insulin resistance is initially compensated for by increased insulin secretion, however later on, insulin secretion is impaired. Insulin production declines quicker than insulin sensitivity in the development from normal to impaired glucose tolerance and diabetes [7]. Insulin resistance has a role in the pathogenesis of diabetic dyslipidemia and is frequent in MetS [8]. According to the Adult Treatment Panel III (NCEP ATPIII) criteria of the National Cholesterol Education Program, MetS is a combination of modifiable risk factors such as hyperglycemia, insulin resistance, hypertension, hypertriglyceridemia, decreased high-density lipoprotein-cholesterol (HDL-C), and

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abdominal obesity [9]. The implications of MetS may be to blame for the cardiovascular complications and death found in the DMII population [10].

Several investigations have suggested that the Na+/K+-ATPase enzyme may be structurally and functionally altered in DMII. A variety of mechanisms have been proposed, including glycosylation and impairment of the Na+/K+-ATPase enzyme, down regulation of the Na+/K+-ATPase enzyme due to low insulin secretion or defects in insulin action, which results in a reduced number of Na+/K+-ATPase enzyme in the cell membrane, a low level of ATP in cells, an abnormal ionic distribution between the extracellular and intracellular environment, and abnormal sodium metabolism [11]. As a result, understanding the probable links between lower Na+/K+-ATPase activity and CVD risk variables in DMII may help us better understand the pathophysiology of diabetic complications [12].

Diabetes mellitus is a metabolic condition caused by a disturbance in carbohydrate metabolism. The key feature is hyperglycemia, which is caused by an insulin secretory deficit or tissue resistance to the action of this hormone. The World Health Organization (WHO) recently revealed statistical statistics that indicate crucial features of the disease's incidence and prevalence, as well as its prognosis: - Diabetes was diagnosed in 9% of adults over the age of 18 in 2014, with the figure expected to double by 2030. Diabetes complications (particularly type II diabetes) are the seventh greatest cause of mortality worldwide; for example, in 2012, 1.5 million people died as a result of diabetes micro- and macrovascular complications. Approximately half of these were caused by stroke, one of the most prevalent consequences of diabetes; The disease's frequency varies by ethnic group and age, being more common in developed countries and after the age of 60. The incidence is lower in poorer nations and predominates between the ages of 35 and 64 [13]. The entire world is facing a type 2 diabetes pandemic (diabetes mellitus) as a result of the westernization of lifestyle, the aging population, and urbanization, all of which result in dietary changes, the adoption of a sedentary lifestyle, and the development of obesity. Diabetes prevalence varies greatly depending on the population investigated, age, gender, socioeconomic level, and lifestyle. The projections for 2025 are concerning, with the IDF / WHO projecting a 9% prevalence of diabetes. Closer monitoring of the population and the advancement of diagnostic technologies have been major factors in recent years, leading to an increase in the incidence of the disease [14]. However, at least 30% of people have undetected type 2 diabetes. Type 2 diabetes accounts for 80-90% of all diabetes occurrences and is more common in those who are overweight or obese. He frequently has an extended time of asymptomatic patients who are not diagnosed. According to research, more than half of the patients had one or more chronic diabetic problems at the time of diagnosis. Diabetes is linked to a slew of chronic problems, the end result of which is reduced quality of life and premature death. The proposed technique for limiting these impacts is early detection and treatment. Diabetes is an etiologically complex and multifaceted disorder. Insulin insufficiency caused by autoimmune death of Langerhans cells and/or the body's resistance to the action of this hormone are widely accepted etiological processes [15]. Additional etiological mechanisms of diabetes include a biochemical defect in incretin secretion (intestinal hormones secreted postprandially to stimulate insulin secretion), genetic predisposition, increased stress-induced epinephrine secretion, obesity-induced lipotoxicity, and consequent insulin deficiency [16].

2. Conclusion

Given the preceding findings, decreased Na+/K+-ATPase activity in DMII with poor disease control may advance DMII to DMII with MetS and cardiovascular consequences. These findings highlight the importance of conducting an early and ongoing assessment of CVD risk in persons with newly diagnosed diabetes. In these individuals, continuous monitoring of risk factors such as MetS components and appropriate intervention will enhance diabetes management and prevent or delay the progression of diabetes to cardiovascular problems.

Compliance with ethical standards

Disclosure of conflict of interest

There is no conflict of interest.

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