

ROLE OF RISK FACTORS IN THE DEVELOPMENT OF COMPLICATIONS OF TYPE 2 DIABETES IN ADULTS

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ABSTRACT

This article discusses the prevention of type 2 diabetes in adults. **The purpose of the work** is to study and implement preventive measures for the prevention of type 2 diabetes. **Material and methods.** Analysis of the results of the questionnaire and clinical laboratory examination. **Results.** There is an increase in diabetes mellitus across the world among different age groups; each country has different climatic and geographic characteristics and dietary traditions. Taking them into account, it is necessary to develop a plan of preventive measures to solve the problem.

Key words: type 2 diabetes mellitus, physical activity, hyperglycemia, smoking.

INTRODUCTION

Relevance of the study. Against the background of the rapid increase in the incidence of type 2 diabetes (T2D), observational multicenter studies provide objective information about the epidemiological situation regarding diabetes and its complications, assess the effectiveness of various treatment regimens and diagnostic strategies aimed at identifying systemic vascular complications of the disease [3].

The modern strategy for treating T2D is determined by the necessity of lifelong medication intake and multifaceted lifestyle changes, including adherence to the principles of healthy eating and adequate physical activity, self-monitoring of blood glucose levels, as well as regular medical examinations to timely detect and treat complications and comorbid conditions (dyslipidemia, arterial hypertension, coronary heart disease, etc.) [21].

According to the World Health Organization, no country in the world has sufficient financial resources to fully meet the growing needs of national healthcare. Under these conditions, the rational use and optimization of limited

budgetary funds is a priority task in the organization of diabetes care for the population [3].

To plan and organize the provision of specialized medical care for patients with chronic diseases, including T2D, selective observational epidemiological studies are conducted in various countries. These studies provide more in-depth information about the socio-demographic characteristics of patients, the nature of specialized medical care provided to them, the frequency and prevalence of diabetes complications and comorbid conditions, and the effectiveness of pharmacotherapy [3].

Materials and methods of research. To identify risk factors for T2D, we conducted a survey using questionnaires developed by us among 169 patients aged 18-89 who were receiving treatment at the Republican Specialized Scientific and Practical Medical Center of Endocrinology named after Academician Y. Kh. Turakulov.

All data (socio-demographic indicators, anthropometric indicators, HbA1c levels, glucose, clinical and biochemical analysis values, and information from the questionnaires) were transferred to a unified database after the first stage of the study was completed. Statistical analysis was performed using a standard data processing package.

Results and discussion.

To date, significant experience has been accumulated worldwide in conducting control epidemiological studies among patients with T2D. The first studies date back to the late 1990s. For instance, in 1998, the first European study analyzing the Cost of Diabetes in Europe (CODE-2) was conducted, which, based on questionnaire analysis, calculated the direct and indirect costs of treating T2D in eight European countries (France, Germany, Belgium, Italy, the Netherlands, Spain, Sweden, and the United Kingdom), as well as assessed the prevalence of chronic complications of T2D and their impact on the cost of treatment and the quality of life of patients [11]. In the CODE-2 study, 69% of patients had an HbA1c level greater than 7% [3].

The modern pathology of the adult population is characterized by an increase in the number of individuals suffering from diabetes, predominantly type II, rapidly increasing obesity, and a rise in thyroid diseases. According to several Russian scientists, hygienists, and clinicians, these processes have taken on the nature of a non-infectious epidemic [11, 20, 25].

Obesity is the main risk factor for the development of metabolic syndrome (MS) and diabetes. Monitoring patients with visceral obesity and timely

identification of a set of metabolic disorders subject to correction are necessary [23].

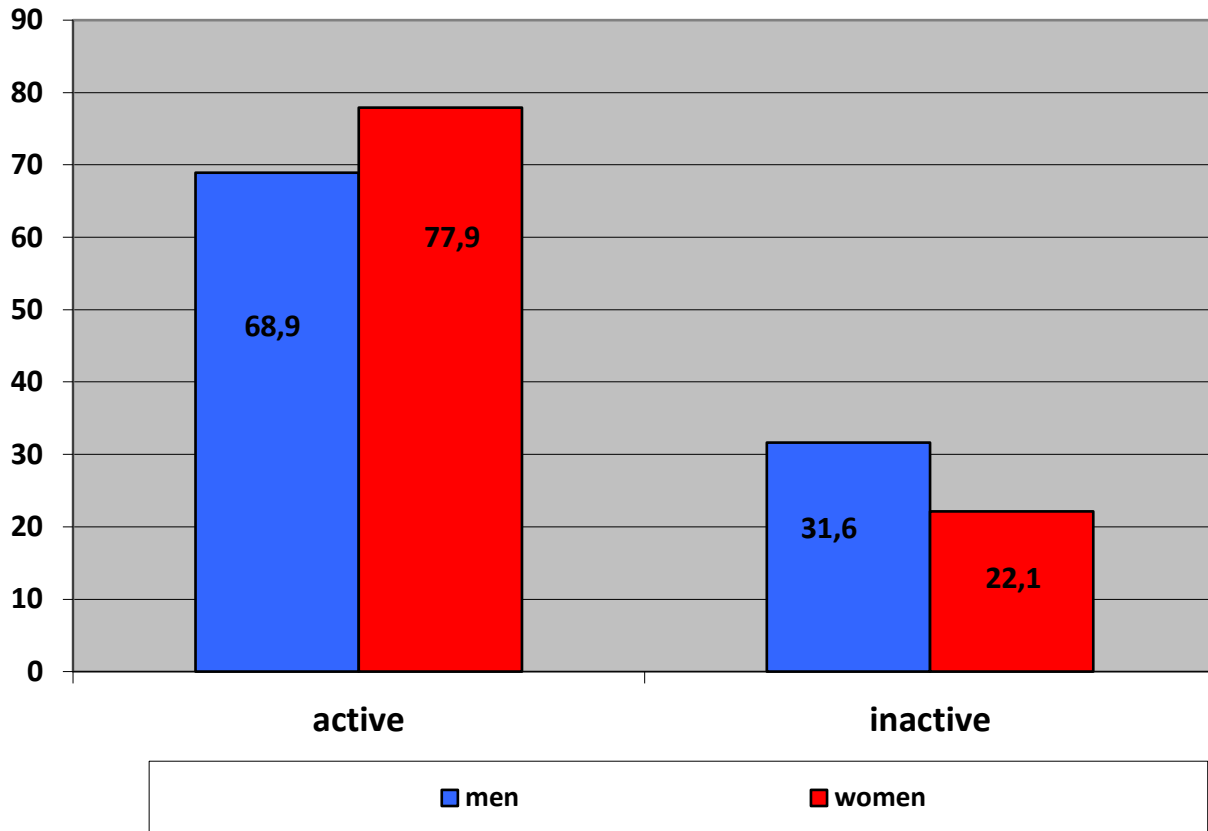


Fig. 1 Physical activity of patients with T2D

According to the World Health Organization, for example, the main cause of the global "epidemic" of obesity is the lack of physical activity among the population combined with the excessive consumption of high-calorie foods [12, 15, 17, 24].

The prevalence of endocrine system diseases among the adult population is significantly influenced by the following factors: changing environmental conditions, stressful situations, infectious diseases, immune disorders, as well as smoking, alcohol consumption, low physical activity, and poor nutrition [1, 7, 8].

Obesity plays a significant role in the development of diabetes. According to Maslova O.V. and Suntsov Yu.I., "the number of diabetes patients is constantly increasing due to population growth and aging, urbanization, the rising prevalence of obesity, and a sedentary lifestyle" [10, 13, 16].

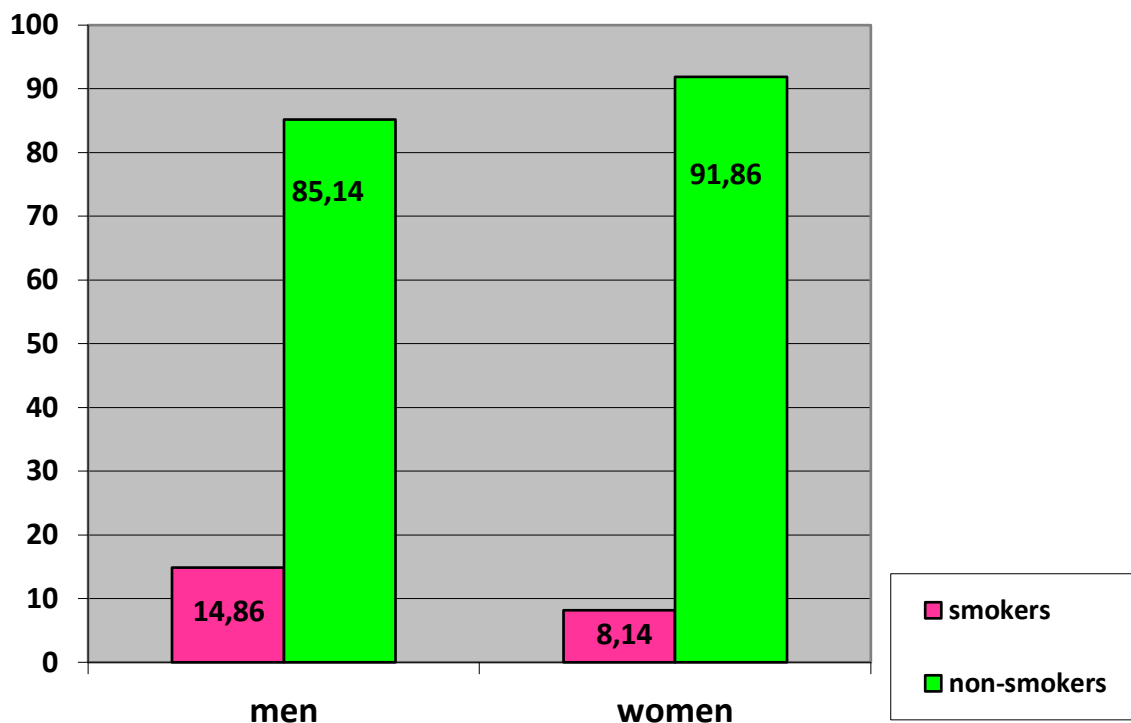


Fig. 2 Presence of harmful habits in patients with T2D

Recent findings allow type 2 diabetes to be considered a condition associated with chronic generalized inflammation. The regular consumption of high-calorie foods leads to hyperinsulinemia, proliferation, and hypertrophy of adipocytes. The metabolic activity of adipose tissue changes, and the amount of circulating free fatty acids increases. These acids interact with Toll-like receptors (a class of cell receptors), resulting in the development of a pro-inflammatory status. The balance of cytokine synthesis is disrupted, altering the expression of both pro-inflammatory (such as interleukin-1 β , tumor necrosis factor- α , monocyte chemoattractant protein-1, etc.) and anti-inflammatory (interleukin-10) cytokines. Leptin resistance develops, and the amount of adiponectin decreases [18, 35].

The main pathogenetic mechanisms of type II diabetes development include insulin resistance, a β -cell secretory defect, and excessive glucose production by the liver. Numerous factors affecting functional activity and the amount of glucose released into the blood throughout the day influence glycemia levels. The circadian regulation of glycemic homeostasis during the day is determined by the degree of physical activity, dietary habits, psycho-emotional state, and more. According to researchers, prediabetes, impaired glucose tolerance, and other manifestations of carbohydrate metabolism disorders are independent risk factors for cardiovascular diseases. When detected early, these data can serve as prognostic markers for the development of diabetes and cardiovascular pathology [6, 26].

Our research has shown that in patients with type 2 diabetes, the leading risk factors for this pathology are, in the first place, depression, followed by arterial hypertension, and in third place, visual impairment and hypercholesterolemia, which was identified in one out of every six patients (Fig. 3).

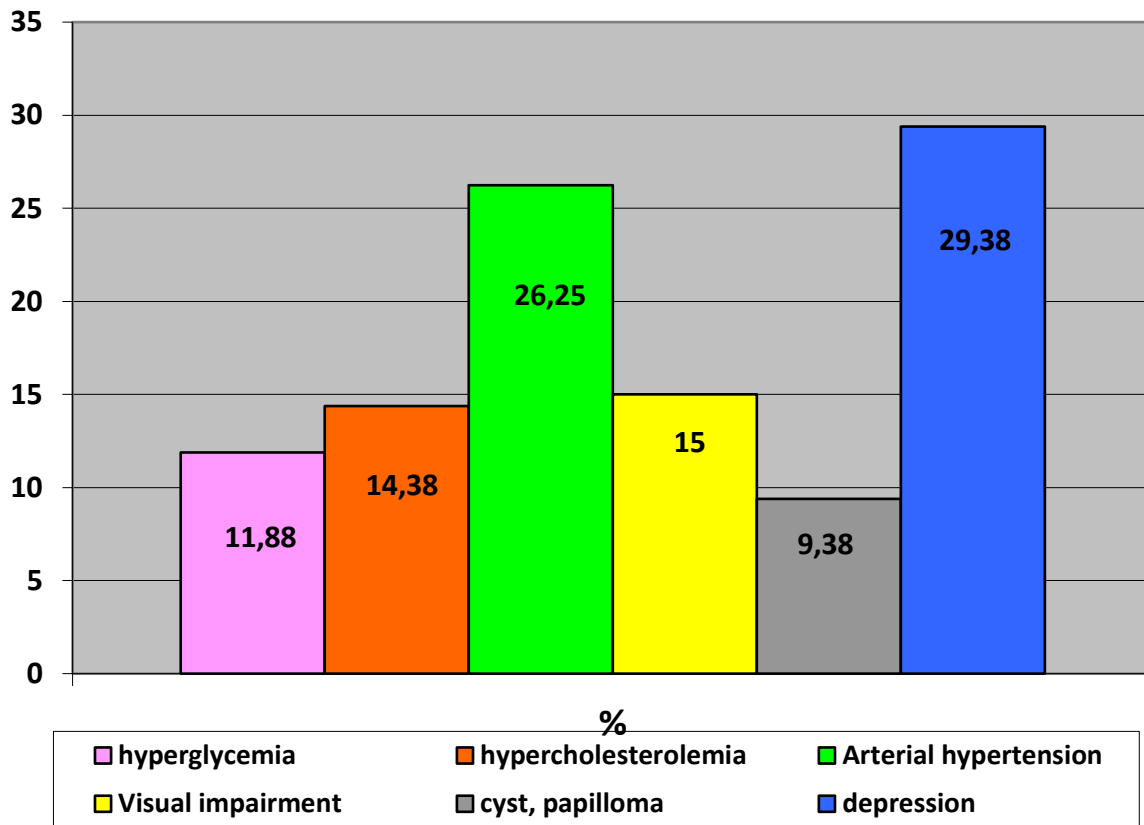


Fig. 3 Presence of risk factors for T2D

The main focus of non-pharmacological therapy is aimed at weight reduction, which can be achieved through two main methods: a balanced diet and an increase in physical activity levels. Studies have shown that when body weight is reduced by 10–15% from the baseline, there is an improvement in muscle tissue sensitivity to insulin, a regression of systemic hyperinsulinemia, and a decrease in visceral fat [5, 29, 30].

T2D often remains undiagnosed for a long time due to the absence of visible symptoms. Nonspecific complaints may include weakness, fatigue, and memory impairment. Chronic hyperglycemia in T2D can present with symptoms such as excessive thirst (up to 3–5 liters per day), skin itching, urinary disturbances such as polyuria and nocturia, weight loss, furunculosis, fungal infections, and poor wound healing. The initial reason for a patient's visit to a doctor may be various symptoms such as leg pain or erectile dysfunction. The treatment of T2D requires a multifactorial approach, including proper glycemic control, achieving target levels for blood pressure and lipid metabolism, using medications that reduce

cardiovascular risk, and lifestyle modifications (including physical activity, weight loss when necessary, smoking cessation, etc.). Multifactorial interventions can not only significantly reduce the risk of microvascular complications and cardiovascular risks but may also lead to a substantial reduction in mortality among patients with T2D [19, 33].

Our research has shown that the main pathological symptoms in patients with T2D were stress, sleep disturbances, and urinary disorders, which were found in every 3rd to 4th patient, while weight loss was observed in every fifth patient, and muscle weakness in every sixth (Fig. 4).

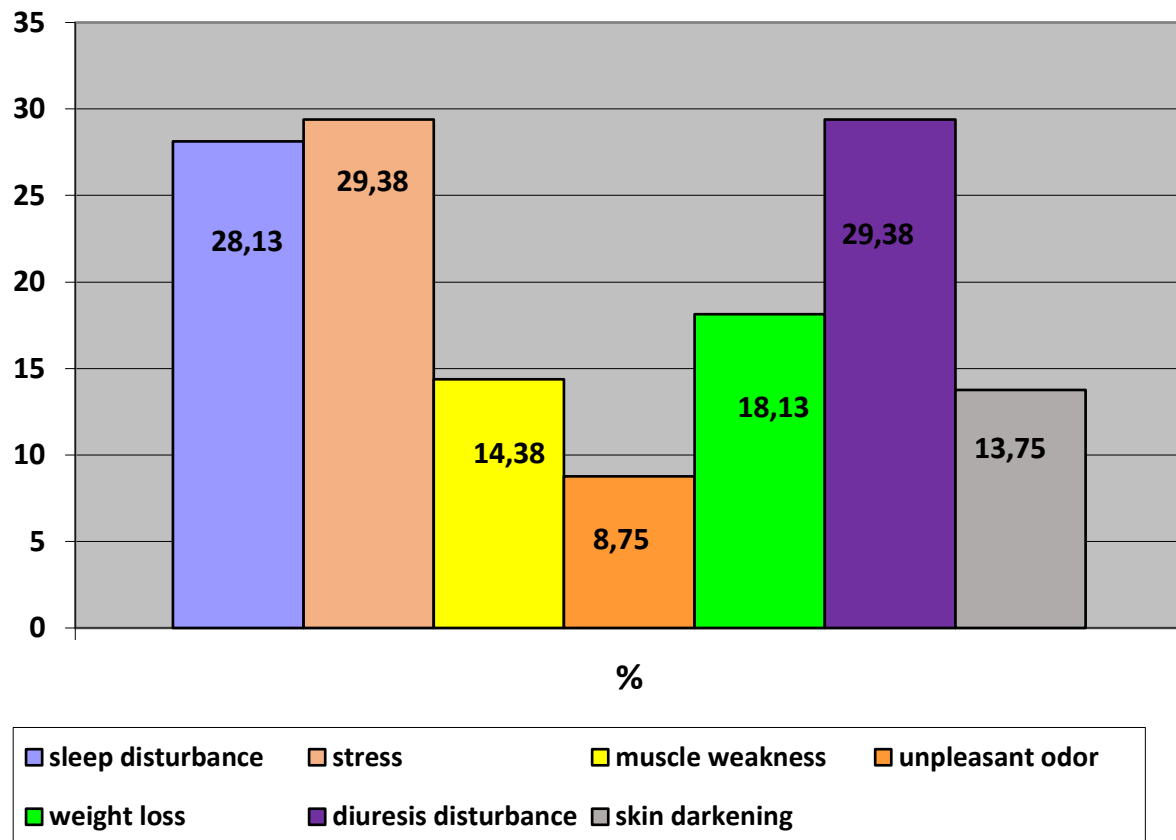


Fig. 4 Presence of pathological symptoms in T2D patients

The average life expectancy of patients with diabetes is significantly lower than that of healthy individuals. The cause of death for these patients is usually the development of diabetes complications, low treatment efficacy, and non-compliance with the endocrinologist's recommendations [2].

One way to reduce the risk of developing diabetes, according to dietitians and diabetologists, is dietary correction, which involves reducing calorie intake, optimizing the quantity and quality of proteins, fats, and carbohydrates, enriching the diet with vitamins and minerals, and using biologically active substances with hypoglycemic effects [14, 22, 27]. Nutrition should be an integral part of the therapeutic plan for patients with type 2 diabetes, taking into account their personal

preferences. People who are overweight or obese are advised to reduce calorie intake by limiting added sugars and fats, particularly those of animal origin, and consuming moderate amounts of foods primarily consisting of complex carbohydrates and protein. The diet should include foods rich in mono- and polyunsaturated fatty acids (fish, vegetable oils), dietary fibers (vegetables, fruits, whole grains), and moderate use of sugar substitutes and sweeteners is permissible [9].

Over the past decades, various dietary approaches for treating type 2 diabetes have been approved, such as low-carbohydrate diets, the Mediterranean diet, Dietary Approaches to Stop Hypertension (DASH), and vegetarian diets [31].

The beneficial effect of the Mediterranean diet on certain diseases, including type 2 diabetes [32], is partially explained by the anti-inflammatory effects of some foods, such as fruits, extra virgin olive oil, red wine, or nuts, which contain biologically active components with antioxidant and anti-inflammatory properties [36].

Secondary prevention of type 2 diabetes aims at early detection of the disease. Screening should be conducted in individuals over 45 years of age, as well as those with a body mass index (BMI) ≥ 25 kg/m² and components of metabolic syndrome (MS) and/or a family history of type 2 diabetes (regardless of age) [4, 28, 34].

Tertiary prevention of type 2 diabetes is aimed at preventing the development of macrovascular and microvascular complications. Metabolic syndrome (MS) is detected in 80% of patients with type 2 diabetes [34]. The components of the syndrome contribute negatively to the course of diabetes and the progression of vascular complications. Prevention measures include weight loss, elimination of atherogenic dyslipidemia, and maintaining target blood pressure levels.

Conclusions. Thus, a proper approach to diabetes prevention, early diagnosis of pathological symptoms and risk factors, and an adequate daily diet composition are also crucial for the survival of patients.

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