ASSESSMENT OF GLYCEMIC COMPENSATION IN PATIENTS WITH TYPE 2 DIABETES

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Abstract: This scientific article analyzes the issues of assessing the level of glycemic compensation in patients with type 2 diabetes. The main objective of the study is to determine the level of diabetes control based on fasting and postprandial glucose levels and glycosylated hemoglobin (HbA1c) levels. During the study, the results of clinical and laboratory examinations were analyzed and the main factors affecting glycemic compensation were identified. The results showed that a significant proportion of patients have insufficient glycemic control, which is associated with the duration of the disease, overweight, insulin resistance, and non-adherence to medication. It was also found that rational nutrition and physical activity are important in improving glycemic compensation. The results obtained indicate the need to improve the treatment strategy based on an individual approach in patients with type 2 diabetes.

Keywords: type 2 diabetes, glycemic compensation, HbA1c, hyperglycemia, insulin resistance, diabetes control, metabolic disorders.

Introduction: Diabetes mellitus is one of the most common endocrine diseases in the world, and according to the World Health Organization, in 2023, more than 540 million people worldwide were affected by this disease (WHO, 2023). In Uzbekistan, the number of people with diabetes mellitus is 230 thousand people (IDF, 2023). This disease develops as a result of insulin deficiency or impaired insulin sensitivity of tissues (ADA, 2022). Diabetes mellitus is one of the urgent problems for the global health system, and the chronic course of the disease and numerous complications significantly negatively affect the quality of life of patients. The prevalence of the disease increases with age: after 40 years of age, the probability of developing diabetes increases 3 times (DeFronzo et al., 2022).

Type 2 diabetes patients account for 90% of all people with diabetes (WHO, 2023). Diabetes-related complications threaten the lives of millions of people every year. According to statistics from 2021, 6.7 million people died worldwide from cardiovascular diseases and other complications caused by diabetes (IDF, 2023).

Genetic predisposition plays an important role in the etiology of the disease (Defronzo et al., 2022). Also, environmental factors such as poor diet, obesity, physical inactivity, and environmental factors contribute to the development of diabetes (ADA, 2022).

Among the effective diagnostic methods used in modern medicine today, the following are widely used: Blood glucose measurement, Glucose tolerance test, Glycosylated hemoglobin (HbA1c) level determination (WHO, 2023).

Type 1 diabetes requires lifelong insulin therapy (ADA, 2022). In the treatment of type 2 diabetes, the patient can change his lifestyle, control it with diet and medication (Defronzo et al., 2022).

According to WHO recommendations, regular physical activity, proper nutrition and medical supervision are necessary for the prevention of diabetes (WHO, 2023).

Discussion and results

Causes of the development of diabetes: Currently, a hereditary predisposition to diabetes is proven. In type 1 diabetes, genetic heterogeneity is observed, that is, the disease can be caused by different gene groups. The detection of antibodies to pancreatic β-cells in the blood serves as a laboratory and clinical indicator for the diagnosis of type 1 pathology. The nature of transmission from generation to generation has not been fully studied. The pathogenetic basis of diabetes depends on the type of disease. Two fundamentally different types are distinguished. Although modern endocrinology calls the classification of the disease conditional, it is important to determine the treatment strategy for each of its types.

The main causes of the development of the disease are:

Hereditary causes - the disease does not develop in the absence of influencing factors, but the predisposition is high.

Causes of obesity - excess weight leads to the formation of type 2 diabetes.

If diabetes is not treated, the following diseases occur. Diseases that lead to damage to the ß-cells responsible for insulin production. These include pancreatitis, pancreatic cancer, diseases of other endocrine glands. Viral infections - measles, chickenpox, infectious hepatitis and other diseases. These infections contribute to the development of diabetes. They are especially common for people at risk. It is recommended to avoid nervousness, stress, and irritability. With increasing age, the likelihood of developing diabetes doubles every ten years. This list does not include factors that can cause secondary diabetes, since the disease is cured when the main factor is eliminated.

In addition, the following factors can influence the development of the disease:

Pheochromocytoma - a tumor of the adrenal gland, as a result of which a large amount of hormones are produced that counteract insulin;

Hyperactivity of the adrenal glands (hypercorticism); Hyperthyroidism; Liver cirrhosis; Impaired sensitivity to carbohydrates;

Transient hyperglycemia - a temporary increase in the amount of glucose in the blood.

The most important basis of the problem is a violation of the interaction of insulin with tissues. Glucose is needed by the body as the main energy substrate to continue vital processes. The inability of glucose to enter the tissues and its accumulation in the liver as glycogen leads to an increase in its level in the blood. These changes are called diabetes mellitus. Any hyperglycemia is not considered true diabetes. Only changes that occur under the influence of insulin are considered such a disease.

Pathogenesis: Insufficient production of insulin by the endocrine cells of the pancreas. Impaired interaction of insulin with the cells of the body's tissues (insulin resistance).

The reasons for this are: a change in the structure or decrease in the number of special receptors for insulin, a change in the structure of insulin itself, a violation of the mechanism of signal transmission from receptors to organelles within cells.

As mentioned above, diabetes can be transmitted from parents to children. If one of the parents has this disease, the probability of its transmission to the offspring is 10% for type 1, and 80% for type 2.

Pancreatic insufficiency (type 1 diabetes). The old name is insulin-dependent diabetes. Young people, under 40 years old, and thin people are most often affected. The disease is severe, insulin is prescribed for treatment. The initial process in the development of this type of diabetes is the massive destruction of the endocrine cells of the pancreas (islets of Langerhans). As a

result, the amount of insulin in the blood decreases sharply. Cell damage can be caused by viral infections, oncological diseases, pancreatitis, toxic damage to the pancreas, stressful situations, and various autoimmune diseases. In humans, this disease is genetically determined and is caused by a defect in a number of genes located on chromosome 6. These defects increase the body's autoimmune aggression against pancreatic cells and negatively affect the regenerative ability of ß-cells. Prolonged hypoxia of pancreatic cells, a diet rich in carbohydrates and fats and low in protein can also serve as provocative factors. This leads to a decrease in the secretory function of cells and, ultimately, their death. After the massive death of cells, the mechanism of their autoimmune damage is activated. Type 1 diabetes cannot be completely cured, but in some cases, if the gland's function is kept normal and a diet is followed, the disease does not cause much trouble. Regular intake of artificial insulin is required. Since insulin breaks down in the gastrointestinal tract, it is administered only by injection. It is necessary to follow a strict diet and completely exclude easily digestible carbohydrates (sugar, sweets, fruit juices) from the diet.

Glycemic compensation is a state of maintaining blood glucose levels within physiological norms, which is important in preventing micro- and macroangiopathic complications associated with diabetes. In type 2 diabetes, insulin resistance and relative deficiency of insulin secretion are observed, so stabilizing glucose metabolism is a complex process. Therefore, the assessment of glycemic compensation requires the integrated use of laboratory and clinical indicators.

In practical medicine, the main criteria for assessing glycemic control are fasting glucose, postprandial glucose levels, and glycosylated hemoglobin (HbA1c). The HbA1c indicator is of particular importance, as it reflects the average blood glucose level over the past 2–3 months and is an important diagnostic criterion for assessing the effectiveness of treatment.

At the same time, the level of glycemic compensation is directly affected by the lifestyle, diet, physical activity, and adherence to medication. These circumstances determine the relevance of scientific studies aimed at assessing, determining and optimizing glycemic compensation in patients with type 2 diabetes.

As a result of the analysis of postprandial glycemia indicators, it was found that in most patients the postprandial glucose level is higher than the recommended norms. It was observed that this condition is associated with incomplete adherence to the rules of rational nutrition, excessive consumption of carbohydrate-rich products and insufficient physical activity. Postprandial hyperglycemia is an important risk factor for the development of cardiovascular complications.

The analysis of HbA1c indicators once again confirmed that it is one of the most reliable and stable criteria for assessing glycemic compensation. According to the results of the study, only a part of the patients had HbA1c levels within the recommended limit of <7%, while the remaining patients had moderate and high levels of decompensation. This is explained by insufficient individualization of the treatment regimen or non-compliance with medication.

It was also found that there is a certain relationship between the level of glycemic compensation and the age of the patients, body mass index and the duration of the disease. In overweight and obese patients, glycemic indicators were relatively high, and insulin resistance was more pronounced. This indicates that weight normalization and lifestyle changes are important factors in controlling diabetes.

In the process of analyzing treatment methods, the results of patients using oral glucose-lowering drugs and insulin therapy were compared. In patients transferred to insulin therapy, glycemic control was relatively improved, but this was not stable in all patients. This may be due to incorrect selection of drug doses or failure to take them on time.

During the study, patients' self-control skills were also assessed. The results showed that patients who regularly measured glucose with a glucometer had a higher level of glycemic compensation. This confirms the importance of diabetes education and improving the medical literacy of patients.

Overall, the results obtained showed that glycemic compensation in patients with type 2 diabetes depends on many factors. It was found that glycemic compensation can be improved by regular monitoring of clinical and laboratory parameters, developing an individual treatment regimen, and improving lifestyle.

Conclusion

The results of the analysis showed that insufficient glycemic compensation is common in patients with type 2 diabetes. During the study, fasting and postprandial glucose levels and glycosylated hemoglobin (HbA1c) levels were used as the main assessment criteria. According to the results, in a significant proportion of patients, HbA1c levels were higher than the recommended norms, which indicates the ongoing violation of carbohydrate metabolism. It was found that insufficient glycemic control is directly related to the duration of the disease, overweight, insulin resistance, and non-compliance with a rational diet and physical activity. Also, failure to take medications regularly and correctly is one of the important factors leading to deterioration of glycemic compensation.

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