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**I. HORBACHEVSKY TERNOPIL NATIONAL MEDICAL
UNIVERSITY OF THE MINISTRY OF HEALTH OF UKRAINE**

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Inessa Nepomnyashchaya

Master's Thesis

**TYPE 2 DIABETES MELLITUS: DIAGNOSTICS, CLINIC, TREATMENT
AND MANAGEMENT FEATURES**

Master of Science in Nursing

**The Scientific Supervisor of the Thesis:
Nadiya Reha, MD, PhD
I. Horbachevsky Ternopil National Medical University
of the Ministry of Health of Ukraine**

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ABSTRACT

Relevance of the study. Type 2 diabetes mellitus (DM2), one of the most common metabolic disorders, is caused by a combination of two main factors: impaired insulin secretion by beta cells of the pancreas and the inability of insulin-sensitive tissues to respond adequately to insulin. Since the release and activity of insulin are important processes for glucose homeostasis, the molecular mechanisms involved in the synthesis and release of insulin, as well as in its detection, are strictly regulated.

Research Assignments.

1. To study the historical and modern aspects of type 2 diabetes mellitus.
2. To investigate risk factors and methods of treatment of type 2 diabetes mellitus.
3. To investigate the features of the development of complications of type 2 diabetes mellitus and the influence of various factors on their occurrence.
4. To investigate the features of nursing in the treatment of diabetes mellitus.
5. To investigate the importance of diet in patients with type 2 diabetes mellitus.
6. Compare the number of complications in patients with type 2 diabetes mellitus, depending on compliance with the recommended diet.

The object of the study. Patients with diabetes mellitus who were interviewed about the recommended diet and analyzed the number of complications caused by type 2 diabetes mellitus.

The subject of the study. The role of the nursing process in the organization of observation, treatment and care of patients with type 2 diabetes mellitus and the

study of the effect of diet on the number of complications in patients with type 2 diabetes mellitus.

Research methods: general clinical methods, collection of anamnesis of illness, life, observation of patients, objective examination, assessment of the general condition of patients, comparison and analysis of data, laboratory and instrumental research methods; complex analytical method; statistical methods of scientific research.

Scientific and practical significance of the study.

When analyzing information about the work of nursing staff with patients with type 2 diabetes mellitus, the basic principles of treatment, diagnosis of diabetes mellitus and communication with patients in the organization of treatment and care were determined; the scientific study also identified key factors in the work of a nurse with patients with type 2 diabetes mellitus, features treatment and diet in patients with type 2 diabetes mellitus; historical and modern aspects of type 2 diabetes mellitus have been studied; the risk factors and methods of treatment of type 2 diabetes mellitus were investigated; the number of complications in patients suffering from type 2 diabetes mellitus was compared depending on compliance with the recommended diet.

Conclusions:

1. Historical and modern aspects of type 2 diabetes mellitus have been studied.
2. Risk factors and methods of treatment of type 2 diabetes mellitus have been investigated.
3. The features of the development of complications of type 2 diabetes mellitus and the influence of various factors on their occurrence are investigated.

4. The features of nursing in the treatment of diabetes mellitus are investigated.

5. The importance of diet in patients with type 2 diabetes mellitus has been investigated.

6. A study and comparison of the number of complications in patients with type 2 diabetes mellitus, depending on compliance with the recommended diet, was conducted.

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INTRODUCTION

Relevance of the study. Type 2 diabetes mellitus (DM2) [1, 2, 47], one of the most common metabolic disorders, is caused by a combination of two main factors: impaired insulin secretion by beta cells of the pancreas and the inability of insulin-sensitive tissues to respond adequately to insulin [4, 26, 27, 48]. Since the release and activity of insulin are important processes for glucose homeostasis, the molecular mechanisms involved in the synthesis and release of insulin, as well as in its detection, are strictly regulated [26, 27].

Defects in any of the mechanisms involved in these processes can lead to a metabolic imbalance responsible for the development of the disease [1, 4, 35, 48]. This is the main aspects of DM2, as well as the molecular mechanisms and pathways involved in insulin metabolism [1], leading to DM2 and insulin resistance.

In recent decades, the number of people suffering from diabetes has grown from 108 million to 422 million [49]. In low- and middle-income countries, the prevalence of diabetes is growing faster than in high-income countries. From 2000 to 2016, premature mortality from diabetes increased by 5%. In 2019, diabetes became the ninth leading cause of death in the world and is estimated to be the direct cause of 1.5 million deaths. WHO strives to stimulate and support the adoption of effective surveillance measures [48], prevention [1, 34] and control of diabetes and its complications [33], especially in low- and middle-income countries.

Diabetes mellitus is one of the leading causes of blindness, kidney failure, heart attacks [3, 5], stroke and amputation of the lower extremities [33].

A healthy diet [9, 23, 31], regular physical activity [12, 13], maintaining a healthy body weight and abstaining from tobacco use can prevent [1, 28, 34] or delay the onset of type 2 diabetes.

Diabetes is treatable [7, 10, 32, 39, 40, 41, 42], and diet [9, 23, 31], physical activity [12, 13], medication and regular glucose monitoring [6, 32, 36], management [22] and treatment of complications help to prevent or delay the onset of its consequences.

A common consequence of uncontrolled diabetes is hyperglycemia, or elevated blood sugar levels, which eventually leads to serious damage to many body systems [5], especially nerves [2] and blood vessels [3, 5].

Type 2 diabetes mellitus affects more than 95% of all patients who have diabetes [2, 47, 48]. This type of diabetes occurs mainly against the background of overweight and insufficient physical activity [12, 13].

Its symptoms may be similar to those of type 1 diabetes, but are often less pronounced. As a result, the disease is often diagnosed several years after its occurrence [6], after the appearance of complications [33].

Until recently, diabetes of this type was observed only among adult men and women [46], but now it is increasingly affecting children [44, 45].

It is known that simple measures to maintain a healthy lifestyle contribute to the prevention of type 2 diabetes or allow delaying its occurrence [1, 34]. To increase the chances of preventing type 2 diabetes and related complications [33], a very important task for nurses is [11, 14, 20, 24, 25, 37, 43] to teach patients the principles of treatment, self-help [21], management [22] and prevention diabetes mellitus [33], in connection with which it is necessary to teach patients to achieve a healthy body weight and maintain it; maintain physical activity; adhere to a healthy diet and reduce the consumption of sugar and saturated fats; and not to use tobacco,

since smoking increases the risk of developing cardiovascular diseases [3, 5] in patients with diabetes mellitus.

The purpose of the study: to study the features of the nursing process in the diagnosis of type 2 diabetes mellitus, as well as the organization of nursing supervision, treatment and care of patients with type 2 diabetes mellitus.

Research tasks.

1. To study the historical and modern aspects of type 2 diabetes mellitus.
2. To investigate risk factors and methods of treatment of type 2 diabetes mellitus.
3. To investigate the features of the development of complications of type 2 diabetes mellitus and the influence of various factors on their occurrence.
4. To investigate the features of nursing in the treatment of diabetes mellitus.
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When analyzing information about the work of nursing staff with patients with type 2 diabetes mellitus, the basic principles of treatment, diagnosis of diabetes mellitus and communication with patients in the organization of treatment and care were determined; the scientific study also identified key factors in the work of a nurse with patients with type 2 diabetes mellitus, features treatment and diet in patients with type 2 diabetes mellitus; historical and modern aspects of type 2 diabetes mellitus have been studied; the risk factors and methods of treatment of type 2 diabetes mellitus were investigated; the number of complications in patients suffering from type 2 diabetes mellitus was compared depending on compliance with the recommended diet.

CHAPTER 1
HISTORICAL AND MODERN ASPECTS
TYPE 2 DIABETES MELLITUS
(LITERATURE REVIEW)

Scientists and doctors have been documenting the condition now known as diabetes for millennia. From the origins of his discovery to dramatic breakthroughs in his treatment, many brilliant minds have played a role in the fascinating history of the disease now known to everyone as diabetes mellitus [2, 47, 48].

The first written mention of diabetes symptoms dates back to 1552 BC, when Hesi-Ra, an Egyptian physician, documented frequent urination as a symptom of a mysterious disease that also caused exhaustion. Around the same time, ancient healers noticed that ants were attracted to the urine of people suffering from this disease.

In 150 AD, the Greek physician Arateus described what we now call diabetes as "the transformation of flesh and limbs into urine." Since then, doctors have begun to study more and understand diabetes better.

Centuries later, people known as "water tasters" diagnosed diabetes by sampling the urine of people who suspected it. If the urine has a sweet taste, diabetes is diagnosed. To recognize this feature, in 1675, the word "mellitus", meaning honey, was added to the name "diabetes", which means siphon. It was only in the 1800s that scientists developed chemical tests to detect the presence of sugar in urine [6, 32, 36].

As doctors learned more about diabetes, they began to understand how it could be managed. The first treatment for diabetes involved prescribed exercise, often horseback riding, which was thought to alleviate excessive urination.

In the 1700s and 1800s, doctors began to realize that dietary changes could help manage diabetes, and they advised their patients to do things like eat only fat and animal meat or consume large amounts of sugar. During the Franco-Prussian War in the early 1870s, the French physician Apollinaire Bouchard noted that the symptoms of his diabetic patients improved due to the rationing of food related to the war, and developed individual diets for the treatment of diabetes. This led to the fashionable diets of the early 1900s, which included the "oat cure", "potato cure" and the "starvation diet".

In 1916, Boston scientist Elliott Joslin established himself as one of the world's leading diabetes specialists by creating a textbook "Treatment of Diabetes Mellitus", which reported that fasting in combination with regular exercise can significantly reduce the risk of death in diabetic patients. Today, doctors and nurses who conduct educational work with diabetic patients and their relatives [15, 16, 18, 19, 28, 30, 38] They still use these principles when teaching their patients to change their lifestyle for the treatment of diabetes [28].

Despite these achievements, before the discovery of insulin, diabetes inevitably led to premature death. The first big breakthrough that eventually led to the use of insulin to treat diabetes occurred in 1889, when Oskar Minkowski and Josef von Mehring, researchers at the University of Strasbourg in France, showed that removing the pancreas in a dog can cause diabetes.

In the early 1900s, German scientist Georg Zuelzer discovered that injections of pancreatic extract to patients could help control diabetes.

Frederick Bunting, a doctor from Ontario, Canada, first came up with the idea of using insulin to treat diabetes in 1920, and he and his colleagues began to test their theory in animal experiments. In 1922, Frederick Bunting and his team

finally successfully used insulin to treat a patient with diabetes and the following year were awarded the Nobel Prize in Medicine.

According to the World Health Organization (WHO) [49], diabetes mellitus is a chronic metabolic disease characterized by elevated blood glucose levels, which eventually leads to damage to the heart, blood vessels, eyes, kidneys and nerves. More than 90% of cases of diabetes mellitus occur in type 2 diabetes mellitus (DM2), a condition characterized by a deficiency of insulin secretion by beta cells of pancreatic islets, tissue insulin resistance (IR) and inadequate compensatory insulin secretion [4, 26, 27, 48].

The progression of the disease makes insulin secretion unable to maintain glucose homeostasis, causing hyperglycemia. Patients with DM2 are mainly characterized by obesity or an increased percentage of body fat, mainly in the abdominal region. In this state, adipose tissue promotes the development of IR through various inflammatory mechanisms, including increased release of free fatty acids (FFA) and impaired regulation of adipokines. The main factors of the DM2 epidemic are the global increase in obesity, sedentary lifestyle, high-calorie diets and aging of the population, which have quadrupled the incidence and prevalence of DM2.

Organs involved in the development of DM2 include the pancreas (β -cells and α -cells), liver, skeletal muscles, kidneys, brain, small intestine and adipose tissue. Emerging data indicate the role of adipokine dysregulation, inflammation and abnormalities of the intestinal microbiota, disorders of immune regulation and inflammation, which have become important pathophysiological factors [26, 48].

Epidemiological data show alarming values that predict an alarming predicted future of DM2. According to the International Diabetes Federation (IDF), 4.2 million people died of diabetes in 2019; and 463 million adults aged 20 to 79

years lived with diabetes, and by 2045 this number is likely to increase to 700 million. Diabetes was the main cause of health care spending of at least 720 billion US dollars in 2019 [49].

The largest number of people suffering from diabetes is between the ages of 40 and 59. The incidence and prevalence of DM2 vary depending on the geographical region: more than 80% of patients live in low- and middle-income countries. this creates additional difficulties in effective treatment [10, 40, 42].

Patients with DM2 have a 15% increased risk of all-cause mortality compared to people without diabetes with cardiovascular diseases (CVD) as the main cause of morbidity and mortality associated with DM2. The association of diabetes with an increased risk of coronary heart disease, ischemic stroke and other deaths associated with vascular diseases is very high [3, 5].

In the past, type 2 diabetes was often referred to as "elderly diabetes." In fact, elderly people suffer from it first of all [17, 49]. However, young people are also increasingly suffering from type 2 diabetes. The reason for this is that more and more people are overweight at a young age and move very little [12, 13]. Doctors are increasingly detecting the disease in children and adolescents [44, 45]. About a quarter of teenagers in the United States suffer from diabetes or a pre-existing disease. The term "age sugar" is already incorrect.

The most common symptoms of diabetes mellitus are associated with hyperglycemia [32, 36]. Mild hyperglycemia in the early stages of diabetes mellitus is often asymptomatic; therefore, diagnosis can be delayed for many years. More severe hyperglycemia causes glucosuria, and thus osmotic diuresis, which leads to increased urination, the development of polyuria and polydipsia, the progression of which can lead to orthostatic hypotension and dehydration. Severe dehydration is accompanied by weakness, fatigue and mental changes [8].

Symptoms may appear and disappear in parallel with fluctuations in plasma glucose levels. Hyperglycemia is sometimes accompanied by polyphagia, but the latter, as a rule, is not the main complaint of patients. Hyperglycemia can be accompanied by weight loss, nausea and vomiting, blurred vision and predisposition to bacterial and fungal infections.

In type 2 diabetes mellitus, clinically manifested hyperglycemia may also develop [1, 6, 32, 36], but often there are no symptoms at all, and the disease is detected only during a routine examination. In some patients, the first symptoms are already associated with complications of diabetes mellitus [33], i.e. the disease began long before going to the doctor.

In some cases, the first manifestation of DM2 is a hyperosmolar hyperglycemic condition that develops during a period of stress or when using medications [7, 39, 40] that aggravate the initial disorders of glucose metabolism, for example, corticosteroids.

Diagnosis of diabetes mellitus [6]:

- Determination of fasting plasma glucose (GPN)
- Determination of glycosylated hemoglobin (HbA1c)
- Sometimes oral glucose tolerance test

Diabetes mellitus is indicated by typical symptoms and signs; the diagnosis is confirmed by the results of determining the level of glucose in plasma [32, 36]. The determination is carried out after fasting the patient for 8-12 hours (GPN) or 2 hours after taking a concentrated glucose solution (oral glucose tolerance test, PGTT). The glucose tolerance test is a more sensitive diagnostic test for diabetes mellitus and impaired glucose tolerance than the definition of GPN, but it is more voluminous and its results are less reproducible. Therefore, it is usually rarely used, mainly only for the diagnosis of gestational diabetes and for research purposes.

In practice, diabetes mellitus or impaired regulation of glycemia is usually diagnosed by determining the level of glucose or HbA1c in random blood samples (Table 1.1).

With such definitions, the glucose level > 200 mg / dl. (> 11.1 mmol / L) has diagnostic significance, but may be associated with a recent meal, and therefore, the determination is carried out repeatedly on an empty stomach, although this is not necessary in the presence of symptoms of diabetes mellitus.

The HbA1c measurements reflect the glucose levels that took place during the previous 3 months. Currently, the HbA1c level is included in the diagnostic criteria for diabetes mellitus.

However, HbA1c levels may be falsely high or low), and testing should be carried out in a certified clinical laboratory, the methods of analysis in which are certified and standardized by the reference method of analysis. Measurement of HbA1c levels in outpatient settings should not be used for diagnosis [6], although they can be used for diabetes control [32, 36].

The previously widely used determination of glucose levels in urine is no longer used for the diagnosis or monitoring of diabetes [22, 28], since this indicator is neither sensitive nor specific.

The basis of the disease is a violation of carbohydrate metabolism [1] due to increased immunity of cells to insulin. The tissues are reduced the ability to take and utilize glucose, a state of hyperglycemia develops (elevated plasma sugar levels) [4, 26, 26, 48]. In addition, alternative ways of obtaining energy from amino acids and fatty acids are activated.

Table 1.1 Laboratory parameters in the diagnosis of type 2 diabetes.

HbA1c, %	Glucose	Interpretation of results
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	level	
4	3,8	Carbohydrate metabolism proceeds normally, the risk of diabetes is minimal
4,5	4,6	
5	5,4	
5,5-5,7	6,5	
5,7-6,0	6,5-7,0	Increased risk of diabetes mellitus. It is advisable to limit the use of sweets and consult an endocrinologist.
6,1-6,4	7,0-7,8	High risk of diabetes. It is necessary to consult an endocrinologist.
≥ 6,5	≥ 7,9	The diagnosis of DM is made beforehand. Additional tests are needed to confirm or refute.

HbA1c, % Blood glucose level, mmol/l Interpretation of results

4 3.8 Carbohydrate metabolism is normal, the risk of diabetes is minimal

4,5 4,6

5 5,4

5,5-5,7 6,5

5,7-6,0 6,5-7,0 Increased risk of diabetes mellitus. It is advisable to limit the use of sweets and consult an endocrinologist.

6,1-6,4 7,0-7,8 High risk of diabetes. It is necessary to consult an endocrinologist.

≥ 6.5 ≥ 7.9 The diagnosis of DM is made beforehand. Additional tests are needed to confirm or refute.

To compensate for the balance of glucose, the body begins to remove it through the kidneys (in the urine). A high concentration of sugar in body fluids causes an increase in osmotic pressure, provoking copious and frequent urination. During this process, more fluids and salts are excreted from the body, which leads to dehydration and electrolyte imbalance. All this provokes the main symptoms of the disease - thirst, dry skin, weakness and arrhythmia.

Classification of the disease [35]:

- Light form. For treatment, an adjustment of nutrition is necessary, as well as a small dosage of a hypoglycemic drug. Low risk of complications;
- Medium form. To stabilize the disorders, a constant intake of hypoglycemic agents is necessary. There is a possibility of occurrence of the initial stage of vascular complications;
- Severe form. Patients need a course of tableted hypoglycemic drugs and insulin. Serious diabetic complications arise - angiopathy of small and large vessels, neuropathy, encephalopathy.

Classification according to the degree of compensation of carbohydrate metabolism [1]:

- Compensation phase
- Subcompensation phase
- Decompensation phase

The compensated form of DM is a good condition of a patient in whom treatment manages to achieve normal blood sugar levels and its complete absence in the urine.

With a subcompensated form, it is not possible to achieve such high results, but the blood glucose level does not differ much from the norm, that is, it is no more than 13.9 mmol / l, and the daily loss of sugar with urine is no more than 50

g. At the same time, acetone is completely absent in the urine. The decompensated form is the worst, because in this case it is not possible to improve carbohydrate metabolism and reduce blood sugar. Despite the treatment [7, 32, 41, 42], the sugar level rises more than 13.9 mmol / l, and the loss of glucose in the urine exceeds 50 g per day, acetone appears in the urine. Hyperglycemic coma is possible.

Classification of complications of diabetes mellitus [33]:

- Diabetic micro- and macroangiopathy.
- Diabetic neuropathy.
- Diabetic retinopathy.
- Diabetic nephropathy.
- Diabetic foot.

Additional symptoms include increased fatigue, chronic fatigue, daytime drowsiness, weakness. The skin becomes drier, rashes and fungal formations appear. Bruises easily appear on the body, and wounds and abrasions take a very long time to heal. Women develop candidiasis of the genitals [46], and men - infections of the urethra. Some patients report tingling in the fingers, numbness of the feet. After eating, a feeling of nausea and even vomiting is also noticeable. Headaches and dizziness are not uncommon.

Elevated blood sugar levels often do not cause any symptoms for a long time. However, inside the body, they damage blood vessels in the long term [3, 5], nerves [2] and many organs [5]. Cardiovascular diseases, such as a heart attack, are typical complications of type 2 diabetes.

By the time of diagnosis of type 2 diabetes mellitus [2, 47, 48], the first lesions often already exist, since the disease is detected only years later. Therefore, regular preventive examinations by a doctor are important to identify possible

secondary diseases at an early stage and take appropriate countermeasures [1, 28, 34].

Type 2 diabetes is best prevented with a healthy body weight, a balanced, varied diet [9, 23, 31] and regular sufficient physical exercise [12, 13]. Especially these measures should be applied to people who already have impaired glucose tolerance (but do not have diabetes yet). They should also visit their doctor for regular checkups. Thus, type 2 diabetes can be detected and cured at an early stage [7, 10]. Also, the treatment of type 2 diabetes is aimed at maintaining blood sugar levels within normal limits, improving the body's response to insulin and preventing the development of any complications. The first steps of treatment include increasing exercise [12, 13], improving diet and maintaining a healthy weight [9, 23, 31].

However, over time, medications or insulin may be needed to lower blood sugar levels. As the condition progresses, training in the use of insulin may be required, including self-monitoring [21, 22] and emergency response. Diabetes education specialists help provide information and support at all stages of treatment [32, 39]. Regular follow-up is important to identify and prevent consequences such as eye damage and nerve damage.

CHAPTER 2

OBJECT AND METHODS OF RESEARCH

The object of the study were patients with type 2 diabetes mellitus who were treated in a hospital. At the same time, the peculiarities of the organization of nursing work with patients with type 2 diabetes mellitus and the number of complications depending on diet were studied.

To determine the complications and the effect of diet on their occurrence in patients with type 2 diabetes mellitus, we used general clinical research methods, collected anamnesis of the disease, took into account the life data of patients: life history, disease history, observation, data on the psychological state of the patient, objective examination, assessment of the general condition of the patient, collecting information about the main complaints, comparison, analytical, statistical, laboratory and instrumental research methods.

Our study consisted of patient observations and analysis of the data obtained.

In total, 255 patients with type 2 diabetes mellitus participated in our study. We determined the effects of dieting on the occurrence of complications of type 2 diabetes mellitus. All patients were divided into 2 groups

Group 1 – patients who follow a diet (132 patients)

Group 2 – patients who do not follow a diet (123 patients)

To determine complications, we selected some of the most common complications of type 2 diabetes:

- Cerebrovascular attack
- Hypertension
- Chronic kidney disease, diabetic kidney
- Coronary heart disease

- Depression
- Amputation, diabetic foot
- Osteoporosis

At the conclusion of the scientific work, the analysis and comparison of data, generalization and formation of conclusions were carried out.

CHAPTER 3

RISK FACTORS AND METHODS OF TREATMENT OF TYPE 2 DIABETES MELLITUS

The disease develops due to a combination of hereditary predisposition, and external factors affecting the body during life. By adulthood, negative exogenous effects reduce the sensitivity of cells to insulin, as a result of which they cease to receive a sufficient amount of glucose. The main causes of type 2 diabetes:

- Obesity. Adipose tissue reduces the ability of cells to properly perceive insulin. Being overweight is one of the key risk factors for developing the disease. Obesity is present in 80-90% of patients;

- Improper nutrition. The main cause of obesity is overeating. Increased caloric intake leads to the development of type 2 diabetes. In addition, the abuse of a large amount of sugar provokes jumps in the release of insulin, which also provokes the development of the disease;

- Physical inactivity. Lack of motor activity has a bad effect on the work of most organs of the body, and also contributes to slowing down metabolic processes. Inactivity is accompanied by low glucose consumption by muscles, so it accumulates in the blood;

- Endocrine diseases. Often, the disease occurs against the background of disorders of the endocrine system. There are cases against the background of pancreatic tumors, pancreatitis, hypo- or hyperthyroidism;

- Infectious diseases. In people with hereditary pathology, the initial appearance of diabetes mellitus can be triggered by an infectious disease - herpes, influenza and hepatitis.

The use of any medications for type 2 diabetes mellitus still cannot fully compensate for the effect of improper nutrition on blood glucose levels. Proper nutrition is the most important component of effective treatment of type 2 diabetes mellitus, which will help achieve blood glucose targets.

Approaches to nutrition for people with type 2 diabetes mellitus who have or do not have excess weight, arterial hypertension, etc., will differ somewhat.

The overwhelming majority of overweight people with type 2 diabetes mellitus. It is the excess weight that prevents your own insulin from acting effectively, which is why the blood glucose level remains high. Therefore, weight loss is an indispensable condition for rational treatment. Even moderate weight loss (5-10%) improves carbohydrate metabolism, especially in the early period of the disease.

The carriers of energy in food are its three components: proteins, fats and carbohydrates. The most high-calorie of them are fats, they contain 9 kcal in 1 gram; in proteins and carbohydrates - 4 kcal in 1 gram.

The most effective way to reduce the caloric content of food will be to reduce the fat content in it. This is not only safe, but also useful for a modern person, since our diet, unfortunately, is oversaturated with fats. In comparison with fats, the caloric content of proteins and carbohydrates can be considered moderate, however, in order to achieve a good effect in weight loss, they still need to be slightly limited.

There are a number of products that do not need to be limited with weight loss. On the contrary, it is these products that can compensate for the above limitations and replenish the reduced amount of food. This group of products is mainly represented by vegetables, which are poor in nutrients, but rich in water, as well as vegetable fibers, which are not digested. Vegetable fibers bring many

benefits to the body: they improve intestinal function, help the absorption of vitamins, have a beneficial effect on fat metabolism, etc.

Carbohydrates are the only nutrients that directly increase glucose in the blood, but this is not the reason for their drastic restriction.

Carbohydrates in the diet of any person, including a person with diabetes, should be enough (at least 50% of the total caloric content), since they are a source of energy for the body. Moreover, different carbohydrates have different effects on blood glucose levels.

There are simple carbohydrates (they are called sugars), which are absorbed very easily, because they consist of small molecules and are quickly absorbed in the digestive tract (after 10 minutes). They immediately and greatly increase the level of glucose in the blood. It is from such carbohydrates that sugar, honey consist, a lot of them are contained in fruit juices (they also exist in natural fruit, but due to the presence of fiber, the absorption of carbohydrates does not occur so quickly), beer. Such carbohydrates are also present in liquid dairy products, but due to the fat content, carbohydrates are not absorbed so quickly.

Another type of carbohydrates are complex (starches), they also increase blood glucose levels, only not as fast and not as much as simple carbohydrates. Representatives of such products: bread, cereals, pasta, potatoes, corn. The starch molecule is large, and in order to assimilate it, the body has to work hard. Therefore, glucose formed as a result of starch splitting is absorbed more slowly (after about 30 minutes), which to a lesser extent increases its level in the blood.

Culinary processing of starchy foods (any grinding, prolonged thermal exposure) promotes the rise of glucose levels in the blood. This means that a strong increase in blood glucose when using starches can be prevented by applying certain methods of processing and cooking. For example, it is more correct to cook

potatoes not in the form of mashed potatoes, but to boil them whole in the peel, so that it remains dense. Porridge is also better not to cook for too long. It is preferable to cook them from large unbroken grains (buckwheat, rice).

The enrichment of food with vegetable fibers prevents an increase in blood glucose levels. Therefore, it is better to buy grain or bran bread, and not from fine flour. Fruits and berries should be consumed in their natural form, not in the form of juices.

There are such types of carbohydrate products – "free", after which the level of glucose in the blood does not increase or increases slightly. These products include almost all types of vegetables in normal quantities (except potatoes). For example, cabbage, lettuce, parsley, dill, radish, turnips, zucchini, eggplant, pumpkin, pepper, etc. Among the products of this group, the largest amount of carbohydrates is contained in beets and carrots, but the rise in blood glucose after them is not very large. Therefore, if you eat them in moderation (for a side dish, no more than 200 g), they can also be ignored.

A person with type 2 diabetes mellitus who receives tableted hypoglycemic drugs or only follows a diet, there is no need to accurately calculate the amount of carbohydrates in food. Many people with diabetes have heard of so-called bread units. A system of such counting exists for those who receive insulin. It allows you to correlate the amount of carbohydrates consumed with the doses of short-acting insulin that these people with diabetes inject before eating.

Sweeteners allow you to give food a sweet taste without increasing blood glucose levels and without weight gain. But in this case we are talking only about low-calorie sugar substitutes. These include aspartame, saccharin, cyclamate, acesulfame potassium, sucralose, stevioside. They do not affect blood glucose levels and weight at all. However, most "diabetic" foods (cookies, chocolate,

waffles) contain sorbitol, xylitol or fructose instead of sugar, which are almost as high in calories as sugar. Therefore, if you are overweight, you need to limit them as much as possible, just like ordinary sweets.

Fractional mode means multiple meals during the day (5-6 times, but still not more often than after 2.5–3 hours) in small portions. This is useful, because if you follow a low-calorie diet, hunger may occur. Increasing the frequency of meals will help to reduce it. In addition, a small portion of food contains a little carbohydrates, and this will facilitate the work of the pancreas.

Due to its high calorie content (7 kcal per 1 g), alcohol can contribute to weight gain. In addition, it directly worsens the indicators of fat metabolism and blood pressure. Therefore, it is necessary to limit alcohol intake as much as possible.

Alcohol is known to have an adverse effect on the liver. It can cause hypoglycemia if a person with diabetes receives hypoglycemic drugs and insulin.

Patients with type 2 Diabetes are often first treated with diet and exercise. If these measures are not sufficient for glycemic control, patients may be prescribed oral antihyperglycemic drugs, an injectable glucagon-like peptide-1 receptor agonist (GLP-1), insulin or a combination of these drugs.

Insulin is necessary for all patients with type 1 diabetes, because without it they develop ketoacidosis; it is also useful for many patients with type 2 diabetes.

An insulin analogue in type 1 diabetes mellitus should ideally mimic the functions of beta cells using 2 types of insulin to provide basal and prandial needs (physiological replacement or basic bolus diagnosis); this approach requires close attention to diet and exercise, as well as the time of intake and doses of insulin.

When insulin is needed in patients with type 2 diabetes, glycemic control can often be achieved with basal insulin in combination with non-insulin

Antihyperglycemic drugs, although some patients may need prandial insulin. Prandial insulin is a short-acting insulin (other names: short, food, bolus) that provides the absorption of carbohydrates coming with food. The introduction of a short insulin is called an insulin bolus. There are genetically engineered short-acting insulins and ultrashort insulins (analogues).

In the Agreed Resolution of the American Diabetes Association and the European Association for the Study of Diabetes, it was emphasized that in "general" glycated hemoglobin, equal to 7%, is the starting point on the basis of which certain decisions are made. However, if we talk not about general, but about individual goals, then in this case glycosylated hemoglobin should be as close as possible to 6%. Thus, the Agreed Resolution indicated that $HbA1c \geq 7\%$ should be considered as an indication of actions aimed at changing therapy.

In this regard, it was noted that the positive effect of the lifestyle change program, primarily aimed at weight loss and increased physical activity, can be noted quite quickly, even before a significant decrease in body weight is recorded. However, the limited long-term effect of reducing the level of glycemia on a long-term basis dictates the need for prescribing drug therapy in most patients. It was also emphasized that the choice of treatment goals and medications to be used to achieve them should be individual for each patient, balancing the potential reduction of glycated hemoglobin and the long-term positive effect on the risk of complications with side effects, drug tolerance and cost of treatment.

According to experts who participated in the development of the Agreed Resolution, due to the fact that lifestyle changes do not allow maintaining metabolic control for a long time, metformin should be prescribed at the first stage simultaneously, almost at the stage of diagnosis. In their opinion, metformin is recommended at the initial stages of pharmacological treatment, in the absence of

special contraindications, due to its effect on the level of glycemia, lack of weight gain and /or hypoglycemia, usually with a low level of side effects, good tolerability and relatively low cost.

It should be noted that in the treatment of type 2 diabetes, biguanides began to be used more than 50 years ago. However, due to frequent cases of lactate acidosis when taking phenformin and buformin, guanidine derivatives were practically excluded from the therapy of diabetic patients. It is known that the frequency of development of this complication varies from drug to drug. The only drug approved for use in many countries is metformin.

The hypoglycemic effect of metformin is due to several mechanisms of action unrelated to the secretion of insulin by beta cells.

Firstly, metformin in the presence of insulin suppresses glucose production by the liver by increasing the sensitivity of hepatocytes to insulin, reducing gluconeogenesis, activating lactate metabolism, increasing glycogen synthesis and reducing glycogenolysis.

Secondly, it reduces insulin resistance at the level of peripheral tissues (fat and muscle) and liver by enhancing and potentiating the action of insulin, increasing the affinity of insulin receptors, restoring impaired post-receptor signal transmission links, increasing the number of insulin receptors in target cells.

Thirdly, metformin increases glucose utilization as a result of anaerobic glycolysis.

Fourth, metformin somewhat slows down the absorption of glucose in the intestine, which in turn leads to smoothing of postprandial peaks of glycemia. Perhaps this is due to a decrease in the rate of gastric emptying and motility of the small intestine.

Fifth, when taking metformin, there is an increase in the anaerobic utilization of glucose in the intestine. Thus, taking into account the listed main mechanisms of action of this drug, it is more correct to speak not about a truly hypoglycemic (hypoglycemic), but about an antihyperglycemic effect that prevents an increase in blood sugar.

Thiazolidinediones (glitazones) belong to a new class of oral hypoglycemic agents acting at the level of receptors activated by peroxisome proliferation (PPAR). These receptors are located mainly in the nuclei of fat and muscle tissue cells. PPAR- γ activation increases insulin sensitivity by increasing the expression of numerous genes encoding proteins responsible for the metabolism of glucose and free fatty acids (FFA). As a result, insulin sensitivity improves at the level of the liver, muscle and adipose tissue.

Thiazolidinediones reduce insulin resistance by increasing the number of glucose transporters (GLUT-1, GLUT-4) and improving the conditions for glucose utilization by tissues, reducing the level of FFA and triglycerides in the blood, strengthening insulin peptide, suppressing glucose production by the liver, reducing tumor necrosis factor and remodeling adipose tissue.

Prandial regulators are short-acting drugs that realize their hypoglycemic properties by acute stimulation of insulin secretion, which makes it possible to effectively control the level of glycemia after meals.

The mechanism of action of drugs of this group consists in the closure of ATP – sensitive K⁺ channels in the cells of the pancreas, which it promotes depolarization and the opening of Ca²⁺ channels, which increases the intake of calcium into beta cells, which, in turn, leads to insulin secretion.

It is important to note that the effect of glinides on ATP-sensitive K⁺ channels in a β -cell is comparable in strength to CM preparations, but these two

groups of drugs realize this effect through different binding sites on the surface of the β -cell.

For many patients with type 2 diabetes mellitus, monotherapy is usually not enough to achieve and maintain glycemic targets for a long time.

A prospective study of diabetes in the UK (UKPDS) demonstrated a progressive course of type 2 diabetes. It is known that the function of β -cells deteriorates at a rate of about 5% per year from the moment of diagnosis. This explains the decrease in the effectiveness of monotherapy, revealed when assessing the number of patients who had a glycosylated hemoglobin level of less than 7% after 3.6 and 9 years from the start of follow-up. Thus, in order to maintain glycemic control and prevent the development of diabetes complications, it is necessary to constantly strengthen hypoglycemic therapy. Therefore, the use of combination therapy in the early and subsequent stages of the disease is considered quite justified. It should be noted that the most preferred are combinations of oral hypoglycemic drugs that affect both pathophysiological defects of type 2 diabetes mellitus (for example, metformin in combination with sulfonylurea, sulfonylurea in combination with exenatide). The most effective combination is insulin combined with metformin.

An important role in the treatment of patients is played by the degree of implementation of the recommendations prescribed by the doctor (compliance). Obviously, the greater the number of drugs, the lower the compliance. In this regard, pharmaceutical companies have developed fixed combination drugs. Such therapy provides maximum effectiveness in achieving almost normal glycemic control: it is possible to minimize the side effects of the combination components due to low dosage. All this leads to an improvement in the quality of life of patients and increases adherence to treatment.

CHAPTER 4

COMPLICATIONS OF TYPE 2 DIABETES MELLITUS AND THE INFLUENCE OF VARIOUS FACTORS ON THEIR OCCURRENCE

In patients with diabetes mellitus, long-term insufficient control of hyperglycemia leads to many complications, mainly associated with damage to small and /or large vessels (micro- and macroangiopathy).

The mechanisms of development of vascular diseases in diabetes mellitus include:

- Glycosylation of blood serum and tissue proteins to form glycation end products
- Superoxide production
- Activation of protein kinase C, a signaling molecule that increases vascular permeability and causes endothelial dysfunction
- An increase in the rate of hexosamine biosynthetic and polyol conducting pathways, which leads to the accumulation of sorbitol in tissues
- Hypertension and dyslipidemia, which usually accompany diabetes mellitus
- Arterial microthrombosis
- Proinflammatory and prothrombotic effects of hyperglycemia and hyperinsulinemia, which weaken vascular autoregulation

The defeat of microvessels is the basis of three frequent and severe manifestations of diabetes mellitus:

- Retinopathy
- Nephropathies
- Neuropathies

Poor wound healing is also associated with the defeat of microvessels; even with small skin injuries, deep easily infected ulcers can form, especially on the legs. Intensive glycemic control allows you to prevent or delay many of the complications, but once they occur, they are already irreversible.

Macroangiopathies include atherosclerosis of large vessels, which can be complicated:

- Angina and myocardial infarction
- transient ischemic attacks and strokes,
- damage to peripheral arteries

Another serious complication is a violation of immunity due to the direct effects of hyperglycemia on the cells of the immune system. Diabetic patients are partially susceptible to bacterial and fungal infections.

In the United States, diabetic retinopathy is the most common cause of blindness among adults. Initially, it is manifested by microaneurysms of the retinal capillaries (background retinopathy), and later by neovascularization (proliferative retinopathy) and macular edema. There are no early symptoms or signs, but eventually blurring of the background, detachment of the vitreous or retina, as well as partial or complete loss of vision develop; the rate of progression varies greatly.

Screening and diagnosis are carried out with the help of retinal examination, which should be carried out regularly (usually annually) in type 1 and type 2 diabetes mellitus. Early diagnosis and timely treatment are necessary for the prevention of blindness. Treatment includes mandatory careful monitoring of glycemia and blood pressure. In the later stages of retinopathy, panretinal laser coagulation of the retina or, less often, vitrectomy may be required. New drugs are also used to treat macular edema, which are also used as an additional method of

therapy for proliferative retinopathy is vascular endothelial growth factor (VEGF) inhibitors.

In the United States, diabetic nephropathy is the leading cause of chronic kidney disease. Diabetic nephropathy is characterized by thickening of the glomerular basement membrane, expansion of the mesangium and glomerulosclerosis. These changes are accompanied by an increase in glomerular pressure and a progressive decrease in glomerular filtration rate. Systemic arterial hypertension accelerates these processes. Before the development of nephrotic syndrome or renal failure, symptoms are usually absent.

Diagnosis is based on determining the level of albumin in the urine. After the diagnosis of diabetes mellitus (and then annually), it is necessary to monitor the level of albumin in the urine, which allows detecting nephropathy in the early stages. Monitoring can be carried out by analyzing the albumin/creatinine ratio in a urine sample using reagent test strips or the total albumin level in daily urine. A ratio of > 30 mg/g (> 3.4 mg/mmol) or albumin excretion of 30 to 300 mg/day indicates a moderate increase in albuminuria (formerly called microalbuminuria) and early diabetic nephropathy. Excretion of albumin in urine > 300 mg / day is considered increased albuminuria (the previous name is macroalbuminuria) or explicit proteinuria, and means progressive diabetic nephropathy. As a rule, a urine test with an indicator strip is positive only if the protein excretion exceeds 300-500 mg/day.

Treatment involves strict glycemic control in combination with blood pressure control. For the treatment of arterial hypertension and to prevent the progression of kidney damage from the earliest stages of albuminuria, an angiotensin converting enzyme (ACE) inhibitor or an angiotensin II receptor blocker (ARB) is used, since these drugs reduce blood pressure in the renal

glomeruli and, therefore, have a nephroprotective effect. However, it has not been proven that these drugs are useful for primary prevention (i.e. for patients who do not have albuminuria). Recently, sodium-glucose cotransporter-2 (SGLT-2) inhibitors have been found to slow the progression of kidney disease in patients with diabetic nephropathy.

Diabetic neuropathy is caused by nerve ischemia (due to microvascular damage), the direct effect of hyperglycemia on neurons and intracellular metabolic shifts that disrupt nerve function. There are many types, including:

- Symmetrical polyneuropathy (with damage to small and large fibers)
- Autonomous neuropathy,
- radiculopathy,
- Cranial neuropathy
- mononeuropathy

The most common is symmetrical polyneuropathy affecting the distal parts of the legs and arms (by the type of "socks" and "gloves"). It is manifested by paresthesia, dysesthesia or a painless loss of tactile, vibrational, proprioceptive or temperature sensitivity. This can lead to the fact that the patient will not feel the pain caused by tight shoes or the load on the foot, and as a result, an infected ulcer forms on the foot, deformity, fracture or subluxation of the foot (Charcot joint) occurs. Neuropathy with damage to small fibers is characterized by pain, numbness and loss of temperature sensitivity with preserved sensations of vibration and position. In such cases, the probability of the formation of foot ulcers and neuropathic degeneration of the joints increases; the frequency of autonomic neuropathy also increases. The predominant lesion of large nerve fibers causes weakness, loss of vibrational and proprioceptive sensitivity and lack of deep tendon reflexes. Atrophy of the foot's own muscles may occur, forming a "hanging foot".

Autonomous neuropathy can lead to orthostatic hypotension, exercise intolerance, resting tachycardia, dysphagia, nausea and vomiting (due to gastric paresis), constipation and/or diarrhea (including dumping syndrome), fecal incontinence, urinary retention and/or incontinence, erectile dysfunction and retrograde ejaculation, decreased vaginal lubrication.

With radiculopathy, the proximal parts of the lumbar nerve roots (L2-L4) are most often affected, which is accompanied by pain, weakness and atrophy of the muscles of the lower extremities (diabetic amyotrophy), or at the level of the proximal thoracic nerve roots (T4-T12), which causes abdominal pain (thoracic polyradiculopathy).

Cranial neuropathy with lesions of the III pair of cranial nerves is characterized by diplopia, ptosis and anisocoria, and with lesions of the IV or VI pair of nerves – motor paralysis.

Mononeuropathy affecting the median nerve is manifested by weakness and numbness of the fingers, and affecting the fibular nerve – "hanging foot". Diabetic patients are also prone to diseases associated with nerve compression, such as carpal tunnel syndrome. Mononeuropathies can simultaneously affect several single nerves (multiple mononeuritis). These symptoms are more common in older patients and usually disappear spontaneously after a few months (except for compression symptoms).

Symmetrical polyneuropathy is diagnosed by sensory deficiency and weakening of the Achilles reflex. Insensitivity to the light touch of nylon thread makes it possible to identify patients with a high risk of "diabetic foot". Alternatively, a test with a tuning fork with a frequency of 128 Hz can be used to assess the vibration feeling on the back of the first finger.

In all forms of neuropathy, electromyography and nerve conduction studies may be necessary, which are sometimes performed to exclude other causes of neuropathic symptoms, such as non-diabetic radiculopathy and carpal tunnel syndrome.

Neuropathy is treated comprehensively, controlling glycemia, regularly taking care of the legs and relieving pain. Strict control of glycemia can weaken the manifestations of neuropathy. Symptomatic therapy includes topical application of ointments with capsaicin, the use of tricyclic antidepressants (for example, amitriptyline), selective serotonin-norepinephrine reuptake inhibitors (for example, duloxetine) and anticonvulsants (pregabalin, gabapentin). Patients with loss of sensory sensitivity should examine their feet daily in order to detect minor injuries in a timely manner and take measures against their progression and infection, threatening amputation.

Atherosclerosis of large vessels is a consequence of hyperinsulinemia, dyslipidemia and hyperglycemia, characteristic of diabetes mellitus. Manifestations include:

- Angina and myocardial infarction
- transient ischemic attacks and strokes,
- damage to peripheral arteries

The diagnosis is established on the basis of anamnesis and direct examination; the role of screening tests, for example, the score of calcification of coronary vessels, is also being studied. Treatment is reduced to careful control of risk factors for atherosclerosis, including normalization of plasma glucose, lipids and blood pressure in combination with smoking cessation and daily intake of aspirin and ACE inhibitors. A multifactorial approach that includes the management of the control of glycemia, hypertension, dyslipidemia and can be

effective in reducing the rate of development of cardiovascular events. Unlike microvascular diseases, intensive glycemic control alone can reduce the risk of type 1 diabetes, but not type 2.

Diabetic cardiomyopathy is based on many factors, including epicardial obesity, arterial hypertension with ventricular hypertrophy, microangiopathies, endothelial and autonomic nervous system dysfunction, general obesity and metabolic shifts. Violation of the systolic and diastolic function of the left ventricle leads to heart failure and increases the likelihood of its development after myocardial infarction.

Poor control of diabetes mellitus increases the predisposition to bacterial and fungal infections, which is explained by the negative effect of hyperglycemia on the function of granulocytes and T cells. In addition to the general increase in the risk of developing infectious diseases, individuals with diabetes mellitus are more susceptible to fungal infections of the skin and mucous membranes (for example, oral and vaginal candidiasis) and bacterial infections of the feet (up to osteomyelitis), which are usually aggravated by vascular insufficiency of the lower extremities and diabetic neuropathy. Hyperglycemia is a well-established risk factor for surgical infections.

Non-alcoholic fatty liver disease (NAFLD) is becoming more common and represents an important concomitant pathology of type 2 diabetes. Some studies show that more than half of the population with type 2 diabetes has non-alcoholic fatty liver disease. It can also occur in patients with metabolic syndrome, obesity and dyslipidemia in the absence of diabetes mellitus. Non-alcoholic fatty liver disease requires confirmation of liver steatosis by imaging or histological examination and the absence of other causes of fat accumulation (such as alcohol consumption or drugs that cause fat accumulation). Non-alcoholic fatty liver

disease includes non-alcoholic fatty liver (NAFL) and non-alcoholic steatohepatitis (NASH). Non-alcoholic fatty liver disease is observed in $\geq 5\%$ of cases with liver steatosis, but without signs of hepatocellular damage. In contrast, the diagnosis of non-alcoholic steatohepatitis requires both liver steatosis ($\geq 5\%$) and inflammation with damage to hepatocytes. With non-alcoholic steatohepatitis, fibrosis can also occur, which can lead to cirrhosis. The pathogenesis of non-alcoholic fatty liver disease is not fully understood, but it is clearly associated with insulin resistance, leading to the accumulation of triglycerides in the liver. The main methods of therapy remain diet, exercise and weight loss. Pioglitazone may also be effective for patients with diabetes and signs of NASH.

Frequent complications include the so-called diabetic foot (skin changes, ulceration, infection, gangrene); this complication is associated with vascular damage, neuropathy and relative immunosuppression.

Certain musculoskeletal disorders are more common in patients with diabetes mellitus, including muscle infarction, carpal tunnel syndrome, Dupuytren contracture, adhesive capsulitis, and sclerodactyly.

Patients with diabetes mellitus may also develop:

- Ophthalmological diseases not related to diabetic retinopathy (for example, cataracts, glaucoma, corneal erosion, optic nerve neuropathy)
- Hepatobiliary diseases (for example, non-alcoholic fatty liver disease, cirrhosis of the liver, gallstones)
- Skin diseases (for example, ringworm, ulcers of the lower extremities, diabetic dermopathy, diabetic lipoid neurobiosis, diabetic scleroderma, vitiligo, annular granuloma, black acanthosis – a sign of insulin resistance)
- Depression
- Dementia

In the legs with type 2 diabetes, not small, but large vessels (arteries) suffer.

If nerve damage occurs due to prolonged high blood glucose levels, then arterial damage is a manifestation of atherosclerosis and is often associated with an increase in such an indicator as the level of cholesterol in the blood. At the same time, an increased level of glucose in the blood aggravates the severity of the atherosclerotic process.

The predominance of arterial lesions leads to a violation of the blood supply to the legs. This is more typical for elderly patients. A sign of such a lesion at pronounced stages is pain in the legs when walking. They occur in the shins even after a short walk, and a person must stop and wait for the pain to pass before continuing on the way.

People with diabetes are at risk of amputation 25 times more often than those who do not have this disease. However, with proper control of blood glucose levels, a significant number of amputations can be avoided, and with regular examination of the legs, problems can be identified and solved at an early stage.

Acute complications of diabetes are extremely unsafe. They are conditions that develop within days or even hours, in the presence of diabetes. Diabetic ketoacidosis is a serious condition that develops due to the accumulation of intermediate fat metabolism products (ketone bodies) in the blood. It occurs with concomitant diseases, primarily infections, injuries, operations, and malnutrition. It can lead to loss of consciousness and disruption of vital body functions. It is a vital indication for urgent hospitalization.

Hypoglycemia in DM is a decrease in blood glucose levels below the normal value (usually below 3.3 mmol / L), occurs due to an overdose of hypoglycemic drugs, concomitant diseases, unusual physical activity or insufficient nutrition, strong alcohol intake.

Hyperosmolar coma in DM occurs mainly in elderly patients with a history of type 2 diabetes or without it and is always associated with severe dehydration. Polyuria and polydipsia are often observed lasting from days to weeks before the development of the syndrome. Elderly people are predisposed to hyperosmolar coma, as they often have a violation of the perception of the feeling of thirst. Another difficult problem - a change in kidney function (usually found in the elderly) - prevents the clearance of excess glucose in the urine. Both factors contribute to dehydration and noticeable hyperglycemia. The absence of metabolic acidosis is due to the presence of circulating insulin in the blood and/or lower levels of counterinsulin hormones. These two factors interfere with lipolysis and ketone production. Already started hyperglycemia leads to glucosuria, osmotic diuresis, hyperosmolarity, hypovolemia, shock, and, in the absence of treatment, death.

Lactic acid coma in DM patients is caused by the accumulation of lactic acid in the blood and occurs more often in patients over 50 years of age against the background of cardiovascular, hepatic and renal insufficiency, reduced oxygen supply to tissues and, as a consequence, accumulation of lactic acid in tissues. The main reason for the development of lactic acid coma is a sharp shift of the acid-base balance to the acidic side; dehydration, as a rule, in this form there is no coma. Acidosis causes a violation of microcirculation, the development of vascular collapse. Clinically, there is confusion of consciousness (from drowsiness to complete loss of consciousness), respiratory disorders and the appearance of Kussmaul's breathing, a decrease in arterial pressure, a very small amount of urine excreted (oliguria) or its complete absence (anuria). The smell of acetone from the mouth in patients with lactic acid coma usually does not happen, acetone is not detected in the urine. The concentration of glucose in the blood is normal or

slightly elevated. It should be remembered that lactic acid coma develops more often in patients receiving hypoglycemic drugs from the biguanide group (fenformin, buformin).

Choosing a healthy lifestyle can help prevent type 2 diabetes, and this is true even if you have biological relatives living with diabetes. If you have been diagnosed with prediabetes, lifestyle changes can slow or stop the progression of diabetes.

A healthy lifestyle includes:

- Eating healthy food. Choose foods that are low in fat and calories and high in fiber. Focus on fruits, vegetables, and whole grains.

- Become active. Aim for 150 minutes or more per week of moderate to intense aerobic activity, such as brisk walking, cycling, running or swimming.

- Weight loss. Losing a small amount of weight and maintaining it can delay the progression from prediabetes to type 2 diabetes. If you have prediabetes, losing 7-10% of your body weight can reduce your risk of developing diabetes.

- Avoiding inactivity for a long time. Sitting still for a long time can increase the risk of developing type 2 diabetes. Try to get up every 30 minutes and move for at least a few minutes.

People with prediabetes may be prescribed metformin (Fortameth, Glumetsa, etc.), an oral diabetes medication, to reduce the risk of developing type 2 diabetes. It is usually prescribed to elderly people who are obese and unable to lower blood sugar levels with lifestyle changes.

CHAPTER 5

NURSING IN THE TREATMENT OF TYPE 2 DIABETES

Proper organization of care for patients with diabetes at home is an important component in the system of therapeutic measures. The leading role in the organization and provision of care belongs to the average medical staff. Patient care is based on the principles of medical deontology – the science of the principles of behavior of medical personnel to maximize the usefulness of treatment.

The system of nursing care for patients with diabetes has its own characteristics. The main purpose of care is to give the patient the knowledge to act independently in any situation, to do without the help of a doctor, to help realize the need for lifestyle changes, to develop a lifestyle in which all necessary therapeutic measures are planned in advance, included in the daily routine and perceived as a necessary and common phenomenon. One should strive to ensure that after training, the patient (or his family members) began to perceive the disease as an inevitable inconvenience that must be learned to overcome in order to live a full active life. The patient's family members should support this aspiration and should also learn to live without constant fear and feelings of hopelessness.

The nursing process in DM is a scientifically based method of organizing the provision of nursing care and the implementation of a care plan for patients with DM. The care plan is drawn up by a nurse in mutual agreement with the patient in accordance with a specific clinical situation to solve his problems. The purpose of the nursing process is to maintain and restore the patient's independence in meeting the basic needs of his body. The nursing process is a prerequisite for creating a system of professional patient care and includes five components:

- 1) nursing examination (collection of information).

- 2) identification of the patient's problems.
- 3) planning of nursing interventions.
- 4) performing nursing interventions.
- 5) evaluation of the effectiveness of nursing interventions.

Complaints and anamnesis of the disease. When collecting anamnesis, it is important to pay attention to the patient's complaints. They clarify the presence of diabetic and paradiabetic symptoms: weight loss, thirst, frequent urination, hunger, the presence of fungal and pustular diseases of the skin and mucous membranes, which is a sign of sub- or decompensation of diabetes. The patient is also asked about the activities of various organs and systems of his body. It is necessary to find out how and when the disease began, whether other diseases or conditions preceded it. It is important to ask about the presence of diabetes in the next of kin, parents, children. It is necessary to inquire about the profession of the patient, the conditions of his work, life. Specify the duration of the disease, the features of its course, the presence of coma and ketoacidotic states in the past, the level of glycemia and glucosuria in dynamics, the methods of treatment used, their effectiveness (name of insulin, dose, duration of its action, treatment regimen or antidiabetic tablet drugs (name, dose, features of their reception, tolerability), the results of preliminary examinations. The patient is asked about: following a diet (physiological or diet No. 9), about the diet; physical activity during the day. It is also necessary to be interested in the patient's ability to work.

It is important to determine the presence of complications of DM. The patient is asked about visual acuity, the presence of leg muscle cramps, paresthesia of the upper and lower extremities, pain in the lower extremities, headaches, the presence of trophic skin changes.

Clarify the patient's presence of a glucose meter, the ability to use it. It is important to ask about the ability to use the table of bread units and make a menu by bread units; the ability to use an insulin syringe and a syringe pen; knowledge of the places and techniques of insulin administration, prevention of complications (hypoglycemia and lipodystrophy at injection sites); keeping a diary of observations of a patient with diabetes; the development of hypoglycemic and hyperglycemic coma in the past, their causes and symptoms; ability to provide self-help; concomitant diseases (diseases of the pancreas, other endocrine organs, obesity).

To obtain complete information when communicating with a patient, a nurse should adhere to the following principles:

- 1) questions should be prepared in advance, this facilitates communication between the nurse and the patient, allows you not to miss important details;
- 2) it is important to listen carefully to the patient, treat him kindly;
- 3) the patient should feel the nurse's interest in his problems;
- 4) during the conversation, it is recommended to keep short notes so as not to forget important information in the future.

Objective examination of the patient. The plan of objective examination of the patient includes:

- 1) external examination (general condition of the patient, facial expression, consciousness, position of the patient in bed (active, passive, forced), condition of the skin and mucous membranes (color, dryness, humidity), presence of edema);
- 2) measure the height and body weight of the patient;
- 3) determination of the pulse rate, determination of its characteristics;
- 4) measure blood pressure (on both hands);

5) calculate the frequency of respiratory movements, determine the rhythm and depth of breathing;

6) in the presence of edema, determine the daily diuresis and water balance;

7) fix the main symptoms characterizing the condition of:

a) organs of the cardiovascular system (pain in the heart, changes in pulse and blood pressure);

b) respiratory system organs (cough, shortness of breath);

c) gastrointestinal tract organs (oral cavity condition, digestive disorders, stool examination);

d) organs of the urinary system (changes in the appearance and amount of urine excreted);

8) find out the condition of the places of possible parenteral administration of drugs (elbow bend, buttocks, shoulder);

9) determine the psychological state of the patient (adequacy, sociability).

Palpation. Determine the presence of edema on the lower extremities. The fact of edema can be established by pressing a finger on the front surface of the lower part of the lower leg. A dent will appear under the finger, which will disappear in a few minutes.

It is mandatory to determine the pulsation on the arteries of the foot, lower leg and thigh. In the presence of macroangiopathy, pulsation is weakened or absent, especially in the distal parts. It is important to study the surface and deep sensitivity. If there is a diabetic lesion of the feet, there is hypesthesia.

The final link of the first stage of the nursing process is documenting the information received and obtaining a database about the patient.

Identification of the patient's problems.

At this stage, the physiological, psychological and social problems of the patient are identified and a nursing diagnosis is made.

The plan for studying the patient's problems includes:

- 1) identify the actual (real) and potential problems of the patient, the lack of his knowledge;
- 2) identify the factors that caused the emergence of current problems or contributed to the emergence of potential problems;
- 3) identify the strengths of the patient that will help solve current and prevent potential problems.

In most cases, several urgent health-related problems are identified in patients. To solve them, the patient needs to find out the priority of the problem. It can be primary, secondary and intermediate. The primary priority is the problem that requires an emergency (priority) solution. The intermediate priority is related to the patient's health condition, which is not life-threatening, and is not a priority. Secondary priority is given to problems that are not related to a specific disease and do not affect its prognosis.

Actual (real) problems with diabetes: thirst, polyuria, itching, dry skin, increased appetite, weight loss, weakness, fatigue; decreased visual acuity, heart pain, pain in the lower extremities, the need to constantly follow a diet; the need for constant administration of insulin or taking antidiabetic drugs (maninil, diabeton, amaryl etc.).

Lack of knowledge about: the essence of the disease and its causes, diet therapy, self-help with hypoglycemia, foot care, calculation of bread units and menu preparation, use of a glucose meter, complications of diabetes mellitus (comas and diabetic angiopathies) and self-help with comas.

Potential problems with DM: the risk of developing precomatous and comatose conditions, acute myocardial infarction, chronic renal failure, gangrene of the lower extremities, cataracts and diabetic retinopathy with visual impairment, secondary infections, pustular skin diseases; complications due to insulin therapy, slow wound healing, including postoperative.

The next task is to formulate a nursing diagnosis.

The purpose of nursing diagnostics is not to diagnose the disease, but to identify the reactions of the patient's body to the disease. The nursing diagnosis (as opposed to the medical one) changes depending on the change in the patient's body's reaction to the disease.

In the presence of DM , the following nursing diagnoses can be made to the patient:

1. Eating disorders (insufficient or excessive nutrition, weight loss or obesity);
2. Violation of movement (pain, cramps in the legs, their swelling);
3. Sensitivity disorder;
4. Visual impairment;
5. Urinary disorders (urinary incontinence, frequent urination);
6. Violation of homeostasis (dry mouth, thirst, dehydration);
7. Violation of the integrity of the skin due to the presence of a skin defect, trophic skin changes;
8. Violation of the skin (dryness or excessive sweating, itching, pustular, fungal diseases).
9. Emotional lability, anxiety, depression, decreased activity.

Drawing up a plan of medical measures pursues certain goals:

- 1) coordinates the work of the nursing team;

- 2) ensures the priority of care activities;
- 3) helps to keep in touch with other medical services and specialists;
- 4) helps to determine economic expenses (it specifies the materials and equipment necessary to carry out nursing care activities);
- 5) legally documents the quality of nursing care;
- 6) helps to evaluate the results of the activities carried out in the future.

The purpose of nursing activities is to prevent complications of the disease, rehabilitation, social adaptation of the patient. This stage of the nursing process consists of four stages:

- 1) identifying priorities, determining the order of solving the patient's problems;
- 2) development of expected results;
- 3) development of nursing activities;
- 4) making a plan in the documentation and discussing it with other members of the nursing team;

Each plan of nursing activities must have a date of compilation and be certified by the signature of the person who drew up the document.

Planning of nursing interventions in a patient with stop diabetes provides:

- short-term goals: control of glycemia, glucosuria, ketonuria, training, control of foot care, referral to specialists, communication with social services;
- long-term goals: repeated training every 6 months, organization of dispensary observation with control of biochemical parameters and examination by specialists.

Planning of nursing interventions in a patient with DM includes:

1. Providing psychological support to the patient.
2. Organization of the activity and rest regime.

3. Organization of dietary nutrition.
4. Ensuring personal hygiene.
5. Monitoring of regular medical treatment. Performing doctor's appointments.
6. Reducing the risk of complications.

The nurse directly takes care of the patient, following the prescribed plan. The implementation of the plan is the direct implementation of actions aimed at achieving the set goals. Here there are the following requirements:

- Systematic adherence to the plan;
- Coordinating their actions in accordance with the planned and actual condition of the patient;
- Involvement of both the patient and his relatives in the care process;
- Implementation of nursing manipulations by algorithms;
- Provision of pre-medical care according to the standards of nursing practice, taking into account the individual characteristics of the patient;
- Registration of performed actions in the nursing medical history.

The implementation of the plan of nursing activities is carried out in three stages:

Stage I: preparation (revision) of nursing measures established during the planning stage; analysis of nursing knowledge, skills, skills, identification of possible complications that may arise during the performance of nursing manipulations; provision of necessary resources; preparation of equipment;

Stage II: implementation of measures;

Stage III: completion of documentation (complete and accurate entry of completed actions in the appropriate form).

The basis of these activities are elements of patient care.

In the process of implementing care measures - solving patient problems - a nurse trains patients, provides specialist consultations, monitors visits to an endocrinologist, glycemia levels, the presence of glucosuria, ketonuria, provides psychological support and pre-medical medical care, monitors the patient's fulfillment of doctor's prescriptions (physical activity, diet therapy, medication).

At the fifth stage of the nursing process, a final assessment of the patient's nursing care is carried out. The effectiveness of nursing interventions is evaluated, and the plan is adjusted if necessary. The purpose of the final assessment is to determine the result obtained. Nursing care is evaluated continuously - from the assessment of the patient's priority need to the patient's discharge from the hospital or his death.

For a nurse, there is a constant process of collecting and critically analyzing information, which includes:

1. Comparison of planned and received results.
2. Evaluation of the effectiveness of the planned nursing intervention.
3. In the absence or insufficiency of results, reassessment and new planning.
4. Analysis of activities at all stages, adjustment of the plan or preparation of new planning.

Evaluation of the results and correction of the plan make it possible to determine the quality of nursing care, the patient's response to interventions, and identify new patient problems. The assessment of the quality and effectiveness of nursing care is carried out by the patient, his relatives, the nurse herself who performed nursing activities, and the management. It is important to determine whether the expected results have been achieved.

It is necessary to evaluate the patient's response to nursing care, the quality of care provided, and the results obtained. The patient expresses his opinion about

the activities carried out. The result of this stage is the identification of positive and negative aspects in the professional activity of a nurse.

The main aspects of nursing care for a patient with DM are:

1. Psychological support, patient treatment of the patient.

It is necessary to create a positive emotional mood not only in the patient himself, but also in relatives. People with newly started insulin-dependent diabetes and their relatives especially need psychological support. The patient and his relatives should get used to the idea of the disease and realize the inevitability and necessity of fighting it.

In many countries of the world, special mutual assistance groups are organized for this purpose. The nurse explains in an accessible form to the patient and/or his family members the nature of the medical measures being carried out. Training does not just mean informing people with diabetes about the side effects of the prescribed treatment, it implies achieving awareness of all aspects of the therapy of their own disease and the ability to independently amend the details of treatment depending on the specific real situation.

The main issues that need to be discussed with the patient and/or his family members:

- Self-monitoring of blood glucose levels.
- Correction of the dose of insulin therapy.
- Meal planning.
- Permissible physical activity.
- Recognition, prevention and treatment of hypoglycemia.
- Correction of treatment for concomitant diseases.

2. Properly organized mode of physical activity.

The patient's motor activity throughout the day should be feasible. According to researchers, with type I and type II diabetes, a significant physical activity plays a role, physical activity is especially effective in type II diabetes. With a mild form of diabetes, the initial treatment consists in following a diet and moderate physical activity. This combination helps to compensate for the disease and reduces the risk of complications. The dosage of physical activity for people suffering from diabetes occurs through the selection of physical exercises, the choice of initial body positions (lying, sitting, standing), the number of approaches and repetitions to perform a particular motor action, the amplitude of movements, pace, the use of an emotional factor, the degree of difficulty of physical exercises (with varying degrees of diabetes).

There are basic principles of physical activity selection for diabetics:

- individual selection of the intensity and methods of performing exercises for each individual, depending on age, gender, capabilities and health status;
- systematic impact;
- regularity of exercise, because with a long break, the positive effect of physical exertion quickly disappears;
- gradual increase in load: by volume, quantity, intensity;
- moderation of the impact of physical activity.

Physical activity for patients with DM is developed taking into account the functional capabilities of a person, so as not to worsen the patient's condition on the one hand, and on the other hand – to achieve a therapeutic effect.

The emotional factor should contribute to the creation of a positive emotional background in the patient in order to increase the therapeutic and wellness effect, preventing physical and mental fatigue.

Recommendations for diabetics in physical education:

1. Indicators such as regularity, moderation of physical exercises performed have a high degree of importance. During the week, at least 3 classes should be held, each with a minimum duration of half an hour.

2. An increase in the load in the short-term time interval entails the consumption of additional carbohydrates, mainly quickly digested. A moderate load over a long time interval, on the contrary, requires new, additional doses of insulin and a significant increase in the consumption of basic nutrients.

3. As the duration of physical activity increases, the likelihood of delayed hypoglycemia increases. In other words, insulin begins to act intensively only after a few hours 14 after physical activity. The risk component increases even more rapidly if the body receives the load in the fresh air.

4. If the load is expected to be prolonged, then it will be possible to reduce the dose of insulin, the maximum effect of which should occur 2-3 hours after the end of the load.

5. The list of exercises performed must be adjusted with the age of the patient.

6. Performing exercises should be fun. Physical activity allows you to activate the physiological mechanisms in the human body and thereby achieve the following results:

- lower blood glucose. It has been found that working muscles can absorb 20 times more glucose during exercise;
- improve the use of insulin; • normalize metabolic processes in the body.

In addition, physical activity helps to prevent other serious diseases, for example, myocardial infarction or stroke, lowering blood pressure. To improve glycemic control, maintain optimal body weight and prevent cardiovascular diseases, moderate physical activity is recommended (pulse 50-70% of the

maximum heart rate). Duration – up to 150 minutes per week (for example, 5 days a week for 30 minutes) and /or at least 90 minutes per week in case of intense physical activity (pulse is more than 70% of the maximum heart rate). Physical exercises should be done at least 3 times a week, but with no more than 2 days in a row. Shoes should not be tight, but also should not be too loose to avoid scuffs. If necessary (in case of deformities of the feet), you should use special orthopedic shoes. The use of properly selected orthopedic shoes reduces the risk of ulcerative foot defects several times. The nurse should teach the patient this.

3. Rational nutrition. Diet for diabetes is an important part of treatment, as well as the use of hypoglycemic drugs or insulins. Without following a diet, it is impossible to compensate for carbohydrate metabolism. With type 1 diabetes, dieting is vital for the patient, a violation of the diet can lead to a hypo- or hyperglycemic coma. The task of diet therapy is to ensure a uniform and adequate intake of carbohydrates into the patient's body. The diet should be balanced in proteins, fats and calories. Easily digestible carbohydrates should be completely excluded from the diet, except in cases of hypoglycemia. With type 2 diabetes, there is often a need to correct body weight. It should also be noted that alcohol consumption can lead to long-term hypoglycemia, including hypoglycemic coma.

An important condition for the success of diet therapy is the patient's food diary. All the food eaten during the day is entered into it, the number of bread units consumed at each meal and in general per day is calculated. Keeping such a diary allows in most cases to identify the cause of episodes of hypo- and hyperglycemia, promotes patient education, helps to choose an adequate dose of hypoglycemic drugs or insulins, and the nurse – to monitor this section of nursing care. For a patient with DM, you can also give several samples of the menu for a day. The

nurse must convince the patient of the need to strictly follow the diet prescribed by the doctor.

4. Compliance with the rules of personal hygiene. It is important to keep the body and clothes clean. A relative caring for the patient and a nurse should help him in the process of washing, bathing, dressing (if necessary). Daily warm foot baths and the use of special care products to moisturize the skin and heal minor injuries are important. It is necessary to remove hyperkeratoses in a timely manner. Nails should be trimmed with scissors if the sensitivity of the feet is not reduced. Nails should be cut straight, without rounding the corners. If the sensitivity of the feet is impaired, it is recommended not to use scissors, but to treat the nails with a nail file.

5. Monitoring of medical treatment. A nurse should regularly monitor the intake of medications prescribed by a doctor, if necessary, carry out their parenteral administration. It is necessary to inform the patient about insulin therapy (types of insulin, the beginning and duration of its action, connection with food intake, storage features, side effects, types of insulin syringes and syringe pens). It is important to ensure timely administration of insulin and taking antidiabetic drugs.

A nurse should also monitor: the condition of the skin; body weight, pulse and blood pressure; pulse on the artery of the back of the foot; compliance with diet and diet; recommend constant monitoring of glucose in blood and urine. It is important to convince the patient of the need for constant monitoring by an endocrinologist, keeping an observation diary, which indicates the indicators of glucose levels in blood, urine, blood pressure, foods eaten during the day, therapy received, changes in well-being. The nurse should also recommend periodic examinations by an optometrist, surgeon, cardiologist, nephrologist, classes in the "Diabetic School". It is important for the average medical staff to inform the

patient about the causes and symptoms of hypoglycemia, comatose states, convince the patient of the need to immediately contact an endocrinologist with a slight deterioration in well-being and blood parameters, teach the patient and his relatives: calculation of bread units; preparation of a menu according to the number of bread units per day; recruitment and subcutaneous injection of insulin with an insulin syringe; rules of care behind the legs; provide self-help with hypoglycemia; blood pressure measurement.

6. Teaching self-control of diabetes mellitus. The real direction in providing nursing care to patients with DM is to train patients, develop their skills of self-regulation and self-control, depending on the stage of the disease and adaptation to treatment. Knowledge of diet, physical activity, self-control and treatment, of course, provides better control of glycemia. Self-control - accounting by trained DM patients of subjective sensations, the level of glycemia, glucosuria, nutritional characteristics, physical activity and other indicators for making independent therapeutic decisions. Modern portable test systems (glucose meters, test strips) allow you to independently evaluate the necessary parameters with an accuracy close to laboratory, in a comfortable environment for a patient with diabetes. During self-monitoring, the patient determines and analyzes the level of glycemia, sugar and acetone in the urine, blood pressure, body weight. The results of daily monitoring of glycemia, as well as doses of insulin and hypoglycemic drugs (tableted), events that affected changes in the condition (physical activity, hyperglycemia, hypoglycemia) and other indicators are recorded in the self-monitoring diary. Glycated hemoglobin is monitored every 3-4 months, but at least 1-2 times a year; glycemia up to 3-4 times a day (with oral hypoglycemic therapy: at least 1 time a day at different times and 1 glycemic profile per week; on diet therapy 1 time a week at different times of the day); glucosuria 2-3 times a week

ketonuria with an increase in blood glucose $> 14-15$ mmol / l, glucosuria $> 2\%$, with fever and frequent vomiting; body weight measurement – 1 time a week; blood pressure monitoring – daily. It is more difficult for patients who do not keep a self-control diary to achieve stable compensation of carbohydrate metabolism, good control and management of their disease.

Prevention of diabetes involves the identification of risk groups for diabetes: abdominal obesity, hereditary factor, persons over 45 years of age, hypertension. Preventive measures include weight loss and regular physical activity.

CHAPTER 6

THE OCCURRENCE OF COMPLICATIONS OF TYPE 2 DIABETES MELLITUS DEPENDING ON THE DIET

The basis of diabetes treatment is diet and treatment regimen.

The diet should be made up for each patient individually, depending on body weight, age, physical activity, and taking into account whether he needs to lose weight or get better. The main goal of the diet for patients suffering from diabetes mellitus is to maintain blood sugar levels within such limits that correspond to the level of a healthy person, as well as the level of fats in the blood and cholesterol. In addition, it is important that this diet is diverse and contains a sufficient amount of essential nutrients — proteins, mineral salts and vitamins. At the same time, it should provide such an amount of energy that the patient's body weight approaches the ideal and is maintained at this level for a long time. The diet should comply with the principles of rational nutrition.

Diet is the basis of treatment. If it is not observed, there is a danger of poor compensation with the risk of complications. If you do not follow a diet and increase the doses of medications or insulin doses, the patient may increase weight,

worsen the sensitivity of cells to insulin, and diabetes treatment will fall into a vicious circle. The only way to avoid these complications is to adjust the diet in such a way as to normalize weight and maintain it.

The correct composition of the diet for diabetics = 55-60% carbohydrates + 25-20% fat + 15-20% protein. Carbohydrates (saccharides) should be maximally represented by complex carbohydrates, food should contain a sufficient amount of fiber (dietary plant fibers), which prevents the rapid absorption of carbohydrates and the rapid rise of glycemia after eating. Simple carbohydrates (glucose) are absorbed instantly and cause an increase in blood sugar levels. Fats should be mainly of vegetable origin, the amount of cholesterol in food should be regulated depending on its level in the blood, the diet should not lead to an increase in cholesterol levels above critical.

Proteins should be 15-20%, but their total daily dose cannot exceed 1 g per 1 kg of body weight. For adolescents and pregnant women, the required dose of proteins increases to 1.5 g per 1 kg of weight per day. Previously prescribed diets with a high protein content can lead to kidney damage.

If diabetes mellitus is treated correctly (with diet, medications, insulin), a diabetic patient can live a full life. But if it is not compensated, serious complications may occur, early or late.

Early ones include: ketoacidosis — poisoning by fat breakdown products, diabetic hyperglycemic coma (sudden loss of consciousness) or hypoglycemia (impaired consciousness due to low blood sugar). These complications are often provoked by non-compliance with the diet, deviations in treatment or treatment regimen, as well as infectious diseases.

Late complications occur due to prolonged insufficient control of blood sugar. These include damage to the eyes, kidneys, small vessels and nerves of the

lower extremities (the so—called "diabetic foot"), in the latter case - with the risk of ulcers on the legs, up to the need for amputation. The digestive tract, heart and sexual functions may also be affected. Compensation for diabetes mellitus is extremely necessary during pregnancy. To compensate, you need the active participation of the patient himself and regular self-monitoring of blood sugar at home.

To determine the possibility of complications of type 2 diabetes mellitus depending on patients' compliance with the recommended diet, we selected some of the most common complications of type 2 diabetes:

- Cerebrovascular attack
- Hypertension
- Chronic kidney disease, diabetic kidney
- Coronary heart disease
- Depression
- Amputation, diabetic foot
- Osteoporosis

In total, 255 patients with type 2 diabetes mellitus participated in our study.

All patients were divided into 2 groups:

Group 1 – dieting patients (132 patients)

Group 2 – patients who do not follow a diet (123 patients)

Patients were divided into groups based on the results of their survey. Those patients who daily counted the number of calories in food and constantly used the rules of nutrition for diabetes, we included in the 1st group, and those who answered during the survey that they do not count the number of calories in food and do not follow the recommended diet, we included in the 2nd group.

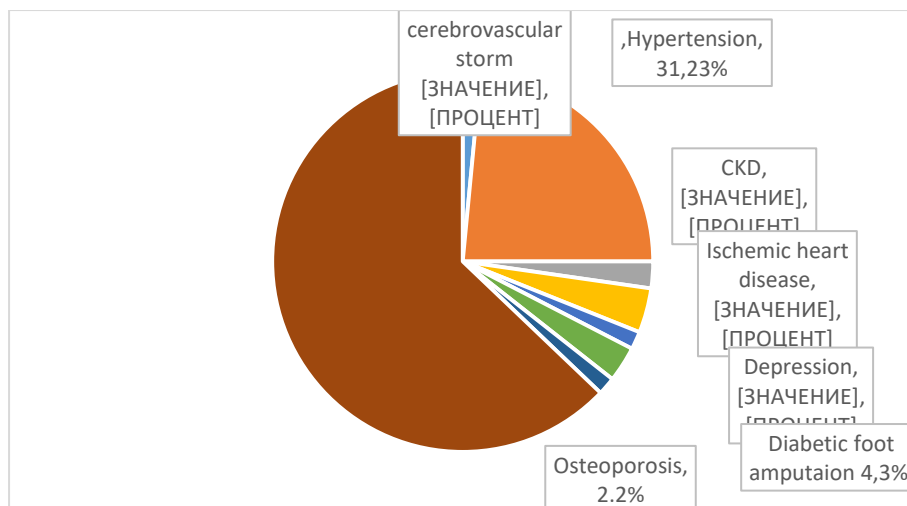


Diagram 6.1 Comparison of the number of complications of type 2 diabetes mellitus in patients following a diet.

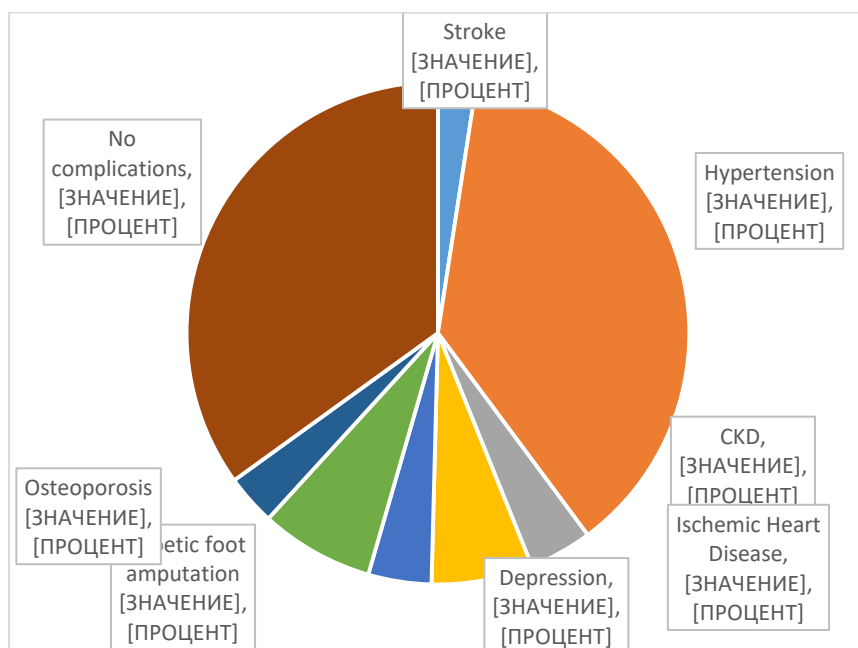


Diagram 6.2 Comparison of the number of complications of type 2 diabetes mellitus in patients who do not follow a diet.

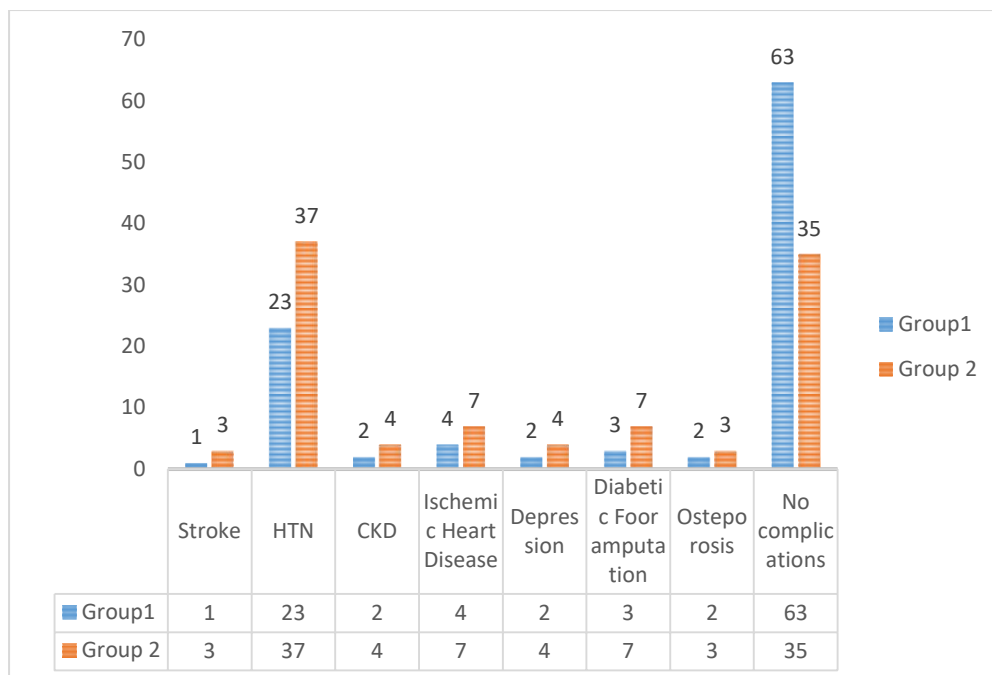


Figure 6.3 Comparison of the number of complications of type 2 diabetes mellitus depending on the diet in relative terms.

Based on the results of the study, we can conclude that patients who do not follow a diet (2 groups) have almost 2 times more complications.

In conclusion, we can say that diabetes mellitus is a very dangerous disease due to the risk of severe complications, but with the right diet and treatment regimen, with properly prescribed treatment, the patient's life is comparable to the life of healthy people.

CONCLUSION

1. Historical and modern aspects of type 2 diabetes mellitus have been studied.

2. Risk factors and methods of treatment of type 2 diabetes mellitus have been investigated.

3. The features of the development of complications of type 2 diabetes mellitus and the influence of various factors on their occurrence are investigated.

4. The features of nursing in the treatment of diabetes mellitus are investigated.

5. The importance of diet in patients with type 2 diabetes mellitus has been investigated.

6. A study and comparison of the number of complications in patients with type 2 diabetes mellitus, depending on compliance with the recommended diet, was conducted.

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