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Importance of the pharmaceutical professional in the treatment of DIABETES MELLITUS

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2. INTRODUCTION

Diabetes mellitus is a group of metabolic disorders that share the common characteristic of hyperglycemia. This hyperglycemia occurs due to defects in insulin secretion, its action or, most frequently, both. Chronic hyperglycemia results in secondary damage to various organs, such as the kidneys, eyes, nerves and blood vessels. There are more than 140 million people suffering from diabetes worldwide, making it one of the most common non-contagious diseases.

3. THEORETICAL CONTEXT

3.1 Normal glucose physiology

The endocrine pancreas is composed of microscopic aggregates, the islets of Langerhans. There are 3 main types: β cells that produce insulin (reduces the blood sugar/glucose ratio); α cells that secrete glucagon (increases/reconstitutes the blood glucose ratio), and**d**that produce somatostatin (suppresses both insulin and glucagon release).

Normal glucose homeostasis is tightly regulated by three related processes: the production of glucose in the liver; its uptake and utilization by peripheral tissues, especially skeletal muscle; and the actions of insulin and counterregulatory hormones, including glucagon, on glucose.

Insulin and glucagon have opposing regulatory effects on glucose homeostasis. During periods of fasting, low levels of insulin and high levels of glucagon facilitate hepatic gluconeogenesis and glycogenolysis (glycogen catabolism) while reducing glycogen synthesis. Plasma glucose levels during fasting are determined primarily by glucose release from the liver. After a meal, insulin levels rise and glucagon levels fall in response to the large glucose intake. Insulin promotes glucose uptake and utilization by tissues.

Insulin is the most potent anabolic hormone known, with several synthetic and growth-stimulating effects. Its main metabolic function is to increase the transport of glucose to certain cells in the body. And the most important stimulus for triggering the synthesis and release of insulin is glucose itself.

3.3 Diagnosis

Blood glucose levels are normally maintained in a very narrow range, usually between 70 and 120 mg/dL. The diagnosis of diabetes is established by an elevation in blood glucose levels through one of the following three criteria:

1) random blood glucose > 200 mg/dL, combined with classic signs and symptoms.
2) fasting blood glucose > 126 mg/dL, on varying occasions.
3) an abnormal glycemic curve (also called oral glucose tolerance test), in which the glucose is > 200 mg/dL, two hours after glucose administration.

3.2 Type 1 Diabetes

Type 1 diabetes (T1D) is an autoimmune disease characterized by the destruction of insulin-producing beta cells. This happens by mistake because the body identifies them as foreign bodies. Its action is an autoimmune response. This type of reaction also occurs in other diseases, such as multiple sclerosis, lupus and thyroid disease.

Type 1 diabetes occurs when the body stops producing insulin (or only produces a very small amount). When this happens, insulin is needed to live and stay healthy. People need daily injections of insulin to regulate their sugar metabolism. Without insulin, glucose

It cannot reach the cells, which need it to burn and transform it into energy. High levels of glucose accumulated in the blood, over time, can affect the eyes, kidneys, nerves or heart.

Most people with T1D develop large numbers of autoantibodies, which circulate in the bloodstream some time before the disease is diagnosed. Antibodies are proteins produced in the body to kill germs or viruses. Autoantibodies are antibodies that "misbehave," meaning they attack a person's own body tissues. In cases of T1D, autoantibodies can attack the cells that produce them.

It is not known for sure why people develop DM1. It is known that there are cases in which some people are born with genes that predispose them to the disease. But others have the same genes and do not have diabetes. It may be something inherent in the body, or an external cause, such as an emotional loss. Another fact is that, in general, it is more common in people under 35 years old.,but it is worth remembering that it can appear at any age.

Some symptoms of DM1: urge to urinate several times, frequent hunger, constant thirst, weight loss, weakness, fatigue, nervousness, mood swings, nausea and vomiting.

3.3 Type 2 Diabetes

It is known that type 2 diabetes has a greater hereditary factor than type 1. In addition, there is a strong relationship with obesity and a sedentary lifestyle. It is estimated that 60% to 90% of people with the disease are obese. The incidence is higher after the age of 40.

One of its peculiarities is the continuous production of insulin by the pancreas. The problem lies in the inability of muscle and fat cells to absorb it. For many reasons, their cells are unable to metabolize enough glucose from the bloodstream. This is an anomaly called "insulin resistance".

Type 2 diabetes is about 8 to 10 times more common than type 1 and can respond to treatment with diet and exercise. Other times, you will need oral medications and, finally, a combination of these with insulin.

Main Symptoms**: i**frequent infections, visual changes (blurred vision), difficulty in wound healing, tingling in the feet and furunculosis.

The term Pre-diabetes is used to identify people who are at potential risk of developing diabetes. It is a form or intermediate state between normality and type 2 diabetes in adults. However, it is known that not everyone will go from being pre-diabetic to becoming diabetic. However, as a precaution, they are considered to be at risk for this progression.

3.4 Treatment

Correct treatment of diabetes means maintaining a healthy lifestyle, avoiding various complications that arise as a result of poor blood sugar control. Prolonged hyperglycemia (high blood sugar levels) can cause serious harm to health.

Hyperglycemia is an increase in blood glucose. The SBD considers that values above 126 mg on an empty stomach are suspicious for diabetes. Values above 200 mg on any occasion indicate the diagnosis. People with diabetes who routinely monitor their glucose levels can detect increases in blood glucose levels, without, however, presenting any symptoms of hyperglycemia. Whenever possible, blood glucose levels should be checked. This can be done on the following occasions: on an empty stomach and before the main meals (lunch and dinner); on an empty stomach and 2 hours after the main meals; and up to two hours after meals (postprandial blood glucose). Tests performed within two hours after meals are considered postprandial blood glucose levels. The interpretation of these results should be made by a doctor.

Some**w**There are several factors that can lead to hyperglycemia: Primary or secondary diabetes mellitus due to other diseases; Eating too much food without any restrictions; Not enough exercise; and Metabolic Syndrome. Symptoms may include: Excessive thirst, excessive urination, extreme hunger with weight loss, fatigue, dry skin, headache, which can progress to nausea, vomiting, drowsiness, difficulty breathing and apple-smelling breath. If the individual detects a high blood glucose level, they should seek medical attention or a health service for diagnosis and treatment.

For people with diabetes, it is essential to undergo several tests. Some, depending on the case, must be done daily. Others may be requested monthly. They are essential to

To check whether the treatment is being carried out correctly or not. And also to check whether the medications are having satisfactory effects. The frequency of visits to the doctor depends on the condition of each individual. Regular check-ups can also detect complications early on, which could be treated in time.

3.5 Lifestyle of a diabetic

Individuals with diabetes must change their lifestyle habits in several aspects.

When it comes to diet, it is necessary to incorporate as many fiber-rich foods as possible into your diet, such as fruits and vegetables. Try to reduce the amount of fats (oil, butter, cream, etc.) and carbohydrates (pasta and sweets), giving preference to grilled and cooked foods. Regular physical activity is also essential for adopting healthier lifestyle habits.

If diabetes is not kept under control, several complications related to the disease may appear, such as nephropathy, retinopathy and coronary artery disease. Losing control of diabetes is the inability to maintain blood glucose levels within physiological levels: between 80 and 110 mg/dl during fasting and levels below 140 mg/dl after meals.

Hyperglycemia favors this degenerative tissue damage, since glucose is captured by proteins to provide the energy contained within them. When it is too high, it alters the functions of the protein, facilitating degenerative complications.

Poorly controlled diabetes, with permanently high blood sugar levels, can damage arterial vessels and nerves. Since vessels and nerves exist in all parts of the body, any organ can be damaged. For example, diabetic retinopathy, the second leading cause of blindness in the world, is the eye; diabetic niphropathy, a common cause of high blood pressure and kidney failure in people who do not control their diabetes; and damage to peripheral nerves, leading to diabetic neuropathy, which causes pain, paralysis and complications such as difficulty urinating, changes in bowel movements, digestion, etc.

The heart and brain can also suffer the consequences of poor diabetes control. This is because the large blood vessels also suffer, as high blood glucose levels increase cholesterol and triglycerides in the blood, favoring early arteriosclerosis with impaired circulation in the brain, which can cause strokes in the brain, heart (myocardial infarction) and limbs (diabetic gangrene).

There are people who do not take care of their diabetes and do not feel anything. However, most of the damage caused by poorly controlled diabetes is silent, that is, it occurs slowly over a long period of time before it becomes noticeable.

The following recommendations should be made for home monitoring of diabetes: Measuring glucose in capillary blood is very appropriate for assessing blood glucose levels before meals, allowing the use of ultra-fast insulins. However, sometimes psychological, economic or social reasons make it difficult to perform this technique. The test is quick and easy to perform. The use of a lancet is recommended, making the test practically painless. There is a wide variety of glucometers available on the market, all of which are of good quality and measure capillary blood glucose levels very safely. Ketonuria indicates the presence of severe diabetes decompensation, and may be seen in patients who have not received treatment; in those who have eventually interrupted insulin treatment; or in the presence of some serious organic complication, such as: AMI, serious infections. The presence of ketones in the urine is an alarm signal that the metabolic situation is out of control. Therefore, it is necessary to seek medical attention or an emergency service to find out what is actually going wrong.

3.6 Complications in Diabetes

3.6.1 Diabetic Foot

For people with diabetes, the feet deserve special attention. Since they are vulnerable to injuries, it is necessary to examine them every day. This should be a habit, especially for those who suffer from neuropathy. This vigilance is necessary because, not infrequently, calluses appear on our feet, even without feeling pain, when we wear shoes. Therefore, the inspection will be based on the search for ulcers, calluses or any other visible problem. It is possible to prevent foot infections. Maintaining good blood flow is also another important aspect. To do this, take measures to lower high blood pressure and cholesterol levels. It is also important to take regular walks or do some other type of physical exercise. Vices such as smoking should be given up.

avoided. Just to give you an idea, 95% of all foot amputations occur in smokers. It is traumatic and should be avoided.

3.6.2 Diabetic Neuropathy

With neuropathy, the nerves may be unable to send messages, send them at the wrong time or very slowly. The symptoms will depend on and vary according to the type of complication and which nerves are affected. In general, we can classify the symptoms as sensory, motor and autonomic. Examples: Sensory: tingling, numbness or burning in the legs, feet and hands. Local pain and imbalance; Motor: weakness and muscle atrophy; Autonomic: dry skin, hair trauma, low blood pressure, digestive disorders, excessive sweating and impotence. Unfortunately, diabetes is the main cause of neuropathy. Its incidence is high and it has different clinical forms, such as:

- Distal polyneuropathy: one of the most common forms of neuropathy, which affects mainly the longest nerves, located in the legs and feet, causing pain, tingling or burning in the legs. It tends to be worse at night (when we pay more attention to symptoms);
- Autonomic neuropathy: mainly causes postural hypotension, such as a drop in blood pressure when standing up (dizziness) and sexual impotence. Other symptoms include a feeling of fullness in the stomach after meals, sweating disorders and other rarer symptoms;
- Focal neuropathy: This is a rare condition resulting from damage to a single nerve or group of nerves. It develops when the blood supply is interrupted due to blockage of the blood vessel supplying that nerve. Or it may be the result of compression of the nerve.
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It is not uncommon for people to have more than one type of neuropathy. The presence of this complication is closely related to the duration of diabetes and the level of glycemic control. Hence the enormous importance of maintaining good glycemic control.

Treatment for mononeuropathies may involve physiotherapy to prevent nerve compression or surgical decompression. Strict control of blood glucose levels is essential to prevent the onset or worsening of diabetic neuropathy. To date, no medication has been proven to be effective in treating distal polyneuropathy, although there are medications that can alleviate symptoms (such as pain and tingling). It is also important to prevent foot injuries or falls.

3.6.3 Diabetic Nephropathy

These are changes in the kidney vessels, causing protein to be lost in the urine. This is a situation in which the organ can reduce its function slowly, but progressively, until it stops working completely. However, this condition is controllable and there are tests to detect the problem early on.

Diabetic nephropathy can affect the proper functioning of the kidneys, causing them to lose their ability to properly filter these substances. One of the proteins that circulates in the blood is albumin, which has a high biological value and provides all the essential amino acids to facilitate the body's recovery. In the initial phase of diabetic nephropathy, small amounts of this protein appear in the urine (detected through the microalbuminuria test). It is common for an increase in blood pressure (hypertension) to also occur at this stage. This situation can lead to advanced kidney failure. In type 1 diabetes, progressive kidney failure occurs in approximately 50% of patients. In type 2, an increasing number of this complication is observed, resulting in control far below what is desired.

In most people with diabetes, good control of blood glucose levels prevents Nephropathy. Even in those who already have microalbuminuria in their urine, well-controlled diabetes prevents the condition from worsening. If there is already significant loss of kidney function (advanced kidney failure), it will be action dialysis or transplant.

3.6.4 Infections

Excessive glucose levels can damage many of the blood's inherent functions, including the immune system's functions. This increases the risk of a person with diabetes contracting some type of infection. This occurs because white blood cells (responsible for fighting viruses, bacteria, etc.) become less effective with hyperglycemia. To make matters worse, high blood sugar levels are a breeding ground for

ideal for some invaders (fungi, bacteria, etc.). This ends up promoting the easy proliferation of these pathogens. Thus, areas such as the mouth and gums, lungs, skin, feet, genitals and post-surgical incision sites are totally subject to this risk. Wounds in general can become real entry points.

The important thing is to maintain good blood sugar control and follow medical advice correctly. However, some cases are worth highlighting:

- We can say that bacteria "love to party" between the gums and the teeth. In this case, it is necessary Be a good vigilant regarding daily oral hygiene, using dental floss. Otherwise, bacteria can settle and, consequently, will act to destroy the bone where the tooth is implanted, leading to inflammation of the gums.

- Women should also be careful about vaginal infections such as candida. albicans (candidiasis), which thrives in a humid environment, feeding on a lot of glucose. Treatment is not difficult, requiring the use of a fungicidal cream.

3.6.5 Myocardial Infarction and Stroke

These complications occur when large vessels are affected, leading to obstruction/ stenosis (arteriosclerosis) of vital organs such as the heart and brain. Good glucose control, combined with physical activity and medication – which can combat high blood pressure, high cholesterol and smoking cessation – are essential safety measures. The incidence of this problem is 2 to 4 times higher in people with diabetes.

3.7 The Pharmacist and Diabetes

The problem of diabetes is serious and causes perplexity among health authorities. In several ways, pharmacists in community (private) pharmacies can help change the current scenario. Professionals can help through their pharmaceutical care services. This is the lever with which professionals can move the world in favor of diabetic patients. By doing so, pharmacists will respond to a great call for their involvement in social issues related to chronic and degenerative diseases in the context of primary care, through the provision of pharmaceutical care.

In Brazil, the Federal Pharmacy Council offers the course "Professional Practice in the Face of the Challenges of Community Pharmacy", aimed at pharmacists who work in community pharmacies with a view to providing practical training to community pharmacists throughout the country.

Pharmacists play a strategic role in the detection, prevention and treatment of this disease. Unfortunately, most patients are diagnosed with diabetes (type 2) when a chronic complication (hypertension, sexual impotence, etc.) appears.

The pharmacist, who is responsible for the laboratory diagnosis of diabetes, can also perform other tests related to the disease, and plays a central role in any other place where he or she works as a health professional. In a community pharmacy, the pharmacist is the health professional who has the most contact with diabetic patients. The patient comes to the pharmacy at least once a month to purchase his or her medication for continuous use, while the doctor's visit is every six months to a year. The pharmacist can, through a quick interview, detect whether there is a risk of diabetes (family history, age, lifestyle, excess weight) and encourage the patient to seek medical advice and have their fasting blood sugar levels tested. It is important to remember that the doctor is the one who makes the diagnosis. It is up to the pharmacist to encourage the patient to seek medical advice. Another important point would be if pharmacies offered capillary blood sugar tests, not as a laboratory diagnosis tool, but for detection and monitoring (as is the case, for example, in Portugal).

Diabetes is on the rise worldwide, including in Brazil. The challenge is to encourage pharmacists working in community pharmacies to become involved in detection, and to encourage diabetic patients to act as educators, providing guidance particularly on aspects related to the correct use of medications (adherence to treatment, possible drug interactions, etc.).

Pharmaceutical care is the great lever with which the pharmacist can "move the world" in favor of the diabetic patient. The pharmacist needs to act more in the field of primary care, paying attention to chronic and degenerative diseases, such as diabetes and arterial hypertension. In the case of type 2 diabetes mellitus, the approach must be made in conjunction with other associated diseases, starting with arterial hypertension. Thus, the diabetic and pre-diabetic patient must be monitored, in addition to their blood glucose and blood pressure,

arterial, in the following aspects: waist measurement and body weight and lipid profile. This monitoring can be complemented with guidance on nutritional aspects, physical activity and continuous encouragement to the patient, so that he/she persists in the treatment. Type 2, because it is asymptomatic and appears more frequently in adults, requires hard work from the pharmacist in adhering to the treatment which, if interrupted, will favor the development of chronic complications, particularly myocardial infarction and stroke.

Studies conducted in the United States have shown that diabetic patients visit pharmacies three to eight times more often than non-diabetics, spending around $39 per visit to the pharmacy, compared to $13 for non-diabetics. However, this study did not include other medications that the patient may be taking (for example, antihypertensives), in addition to the fact that the patient may bring other products needed by his or her family. This does not include diet and light products, disposable needles and syringes, glucose meter test strips, etc. In short, diabetes provides the community pharmacy with the opportunity to offer diabetic patients a wide range of products that complement their drug treatment. This availability must be associated with knowledge of the products. For example, the pharmacist must explain to the patient how the glucometer works and be prepared to answer questions about how the equipment works.

4. CONCLUSIONS

One of the most common diseases that affects the population and is not contagious is diabetes mellitus. It is a metabolic disorder that primarily affects sugars (glucose and others), but also has important repercussions on the metabolism of fats (lipids) and proteins. It is a dysfunction that, if not treated and well controlled, can eventually lead to serious and potentially fatal injuries, such as myocardial infarction, stroke, blindness, impotence, nephropathy, leg ulcers and even limb amputations. On the other hand, when well treated and well controlled, all of these chronic complications can be avoided and diabetic patients can lead a perfectly normal life. Therefore, adequate control of diabetes is really the only way to avoid complications. Pharmacists play a strategic role in the detection, prevention and treatment of this disease. Pharmacists need to work in the field of primary care, paying attention to chronic and degenerative diseases, such as diabetes and high blood pressure.

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