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ОГЛЯДИ

THE PRINCIPLES OF TREATMENT OF DIABETES MELLITUS WITH DIET, INSULIN AND ANTIDIABETIC DRUGS*

F. Agaçi[1], A. Sadedini[1], Y. Themeli[2], E. Çelo[2]

[1] University Hospital «Shefqet Ndroqi», Diabetic Foot Unit, Tirana, Albania
[2] University Hospital «Mother Teresa», Service of Endocrinology and Diabetes, Tirana, Albania
f_agaci@yahoo.com

THE DETERMINATION OF TYPE OF DIABETES MELLITUS

After determination the diagnosis of diabetes mellitus, before starting treatment, we need to determinate necessarily the type of diabetes, because the treatment of type 1 diabetes has special particularities in relation to treatment of type 2 diabetes, either the treatment with diet, or the treatment with medicaments [1, 2].

Miscellaneous examinations make possible to determine the exact type of diabetes mellitus. Some epidemiological, clinical and biochemical data are important for determination of type of diabetes mellitus in clinical practice. [2, 3].

In cases when these data are not significant for determination of diabetes type, we are obliged to do some immunological and genetic examinations [1, 17, 18].

Are given in the table 1 the main data for determination of type of diabetes mellitus [10].

THE TREATMENT OF DIABETES MELLITUS WITH DIET

Previously in Albania was said that diabetes is a disease of the rich men. This statement was based on the fact that in diabetic diet are necessary foods that contain animal proteins which are costly. Today this opinion does not stand, because the lack of animal protein foods, can be substituted with other protein foods, which are less expensive compared to foods with animal proteins [3, 4].

The main goals of dietary treatment are:

- To ensure the energy, that is necessary for normal function of metabolic processes.
- To enable diabetics to arrive ideal or normal weight. This means that overweight or obese diabetics have to reduce their body weight, while weak or underweight diabetics have to increase their weight [5].
- To avoid the use of those foods that cause rapid increase of glycemia [6].

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Table 1

The main data for determination of diabetes mellitus type

Main Clinical and Miscellaneous Data	Type 1 Diabetes	Type 2 Diabetes
Age of Diabetes Beginning	Usually under 40 years old	Usually above 40 years old
Body Weight	Underweight	Overweight, Obese
Classical Signs and Symptoms	Present, expressive	Less expressive or absent
Vascular and Nervous Complications	Are present in 5 years after beginning	Are present any time
Season	Usually in autumn or in winter	At any season
Relationship with Viral Epidemics	Yes	No
Level of Glycemia	High	Moderate
Presence of Ketoacidosis or Ketosis	Ketoacidosis	Ketosis
Treatment of Diabetes	Insulin only	Antidiabetics drugs only, or combined with insulin
Familiar History for Diabetes	Less than 10 %	Between 20–50 %
HLA Antigens	Present	Absent
Autoimunity Data	Present	Absent

- To determine specifically relevant diet for each diabetic patient, have to take account some economic and social factors, which influence the determination of this diet [8, 9].

In compilation of relevant diet for each diabetic patient, have to take account some basic criteria, that will be developed down here [7-9, 11].

- ***Age.*** For children and teenagers with diabetes, have to predominate proteins, because they are plastic material for growth of organism.
- ***Gender.*** For pregnant women, in compile of diet have to account fetus. It is necessary to take account the women who feed the children with brest milk.
- ***Profession.*** For diabetics who do hard physical work, is required hypercaloric diet, while for diabetics who do not do hard physical work, is required normocaloric or hypocaloric diet.
- ***Residence.*** In compilation of relevant diet have to know the residence of patients, because in different geographical regions there are different animal, vegetable and industrial foods.
- ***Social - economic status.*** It is important to know this status, because this status make possible use those foods that are expensive or cheap.
- ***Religion.*** The religion is important to know, because some religions prohibit use of some foods. So, islam religion prohibits the use of pork meat and foods that contain pork meat.
- ***Accompaning diseases.*** These diseases have to take into consideration, because some of these diseases have their specific diets that ought to adapt to diabetic diet.
- ***Body weight.*** It is important to know, because for overweight and obese diabetics is recommended hypocaloric diet, while for underweight diabetics is recommended hypercaloric diet. These diets help diabetics to achieve their ideal weight.

The composition of diabetic diet for each patient is based on some general data [9].

So, 50 % of total calories are taken from carbohydrates, 30 % from oils (lipids), and 20 % from proteins. It is necessary to underline that these percentage can be changed in situations mentioned above.

The calculation of calories is based on BMI (Body Mas Index) formula for each patient.

The calculation of BMI is made by the following formula:

BMI = Weight (kg) / Length (m^2)

When BMI is 10–18.5 kg/m^2, the patient is underweight; 18.5–25 kg/m^2, the patient is with ideal weight, healthy; 25–30 kg/m^2, the patient is overweight; 30–40 kg/m^2, the patient is obese, while when BMI is 40–70 kg/m^2, the patient is very obese.

If BMI is 10.0–18.5 kg/m^2 you should use 25–35 Kcal/kg; if BMI is 18.5–25.0 kg/m^2 — 20–25 Kcal/kg; if BMI is 25–30 kg/m^2 you should use 15–20 Kcal/kg; if BMI is 30–40 kg/m^2 you should use 10–15 Kcal/kg; if BMI is 40–70 kg/m^2 you should use 5–10 Kcal/kg [11].

Normal physiology teaches us that 1 g of carbohydrates gives 4 Kcal of energy; 1 g of proteins gives 4 Kcal of energy, while 1 g of oils (fat) gives 9 Kcal of energy [13].

For example, we have a patient whose weight is 70 kg, his BMI is 18,5–25 kg/m^2. We ought to give him in total 1400 Kcal a day; 50 % of these calories (700 Kcal) are should be carbohydrates; 30 % (420 Kcal), oils (fat), and 20 % (280 Kcal) proteins.

To calculate quantity of grams for carbohydrates, oils (fat) and proteins we have to divide these calories by 4, by 9, and by 4 respectively. So, for carbohydrates 700 ÷ 4 = 175 gr; for oils (fat) 420 ÷ 9 = 46,5 gr; for proteins 280 ÷ 4 = 70 gr.

After determination of quantity in grams as mentioned above patient, have to be consulted with special tables that show quantity in grams of carbohydrates, oils (fat) and proteins for 100 gr of miscellaneous nutritive products [14]. Afterwards we are able to compile concrete diet for each diabetic patient. Lately is recommended healthy diet. By this diet, the patient can eat every nutritive product, sweetmeats, or can take alcoholic drinks, but these nutritive products have to be calculated in total quantity of 24 hours calories [9]. On the base of modern concepts, there are not forbidden meals for diabetics [7-9].

Diabetic patients may drink alcoholic drinks, but it is necessary to underline that alcoholic drinks do not cause hyperglycemia, on the contrary, in most cases they cause hypoglycemia and hypoglycemic coma [12, 13].

Patients with type 2 diabetes, who are obese and have hyperlipidemia in 70 %, should restrict use of foods with high percentage of animal fat and yolk of egg. These restrictions are necessary, because these patients have propensity to develop atherosclerosis, which is the base of macroangiopathy of arteries with large and medium calibrium, especially for coronary and cerebral vessels.

As we know, atherosclerotic damage of mentioned arteries, respectively can cause acute myocardial infarction and stroke [12-14].

Diabetics have to take daily food, not three times a day, as people without diabetes, but six times a day: three main meals and three snacks between main meals: in 11 a.m., in 4 p.m., and before the bedtime. The snacks are necessary to prevent possible hypoglycemic episodes as a consequence of treatment with insulin, sulfanylureas, or metiglinides [13].

Dietary treatment can be the only, when BMI is 30–70 kg/m^2. However, it should be known that it is impossible to equilibrate diabetes with diet only for very obese patients. So, in clinical practice, treatment with antidiabetic drugs, firstly with biguanides should begin parallelly with dietary treatment [5, 6]. Dietary treatment is not the same for all the life; it depends on many factors as age, the way of life, changes of body wheight, changes of profession, miscellaneus diseases, acute or chronic complications of diabetes, and other factors [5, 6, 13].

As was mentioned above, for diabetics with type 2 diabetes, it is recommended to cook using vegetable oils wich are rich with unsaturated fatty acids, such as linoleic, linolenoic and arachidonic acids. These vegetable oils inhibit developing of atherosclerosis, and prevent macroangiopathic complications of diabetes as a consequence [3,4].

THE TREATMENT OF DIABETES MELLITUS WITH INSULIN

The treatment of diabetes mellitus with insulin, was made possible through the discovery of insulin by two distinguished canadian scientists: Charles Banting and Frederic Best, in Toronto (Canada).

Insulin was used for the first time on January 11, 1922 in general hospital of Toronto, in a diabetic patient named Leonard Thomson, with hyperglycemic ketoacidotic coma. This treatment saved the life of this patient. It is necessary to underline that, all patients with

Table 2

The classification of insulins, based on their dynamics of action

Class of Insulins	Start of Action	Maximum Time of Action	Duration of Action
Rapid Acting Insulins	5–10 minutes	1 hour	3–4 hours
Short Acting Insulins	20–30 minutes	2–4 hours	6–7 hours
Intermediate Acting Insulins	1–2 hours	4–8 hours	12–16 hours
Long Acting Insulins	3–4 hours	12–14 hours	24–26 hours
Biphasics Insulins	20–30 minutes	2–3 hours	12–14 hours

type 1 diabetes died from this acute complication before the discovery of insulin [15].

First insulins were produced from pancreatic extracts of calfs and pigs, so its quality was not good. Technology of producing insulins was improving step by step; purified. These insulins are much better than purified insulins from animal pancreatic extracts mentioned above [17].

In recent years, genetic engineering technology made possible to producte insulin analogues, that are the best available insulins. The treatment of diabetes mellitus with insulin only, that is indispensable for survival and for equilibrium of diabetes, is prescribed for diabetics with type 1 diabetes. The treatment of diabetes with insulins is prescribed both and for treatment of diabetics with type 2 diabetes mellituse in some special circumstances. It is necessary to underline that therapy with insulin for these patients may be the only, or be combined with antidiabetic drugs; it can be temporarily or permanent. The classification of insulins is given in table 2 [26].

Temporar insulin mono therapy for the treatment of type 2 diabetes mellitus, is prescribed in the following circumstances:

1. The treatment with insulin is necessary for pregnant women with type 2 diabetes and for women with gestational diabetes wich begins during pregnancy and disappeared after it, because the antidiabetic drugs may cause malformations in fetus. The most of endocrinologists and diabetologists recommend to plan the pregnancy to diabetic women with compensated diabetes, because non-compensated diabetes is bad is both for mother and fetus [16, 17].
2. In surgical intervention, planned or urgent. In planned intervention, the treatment with antidiabetic drugs have to stop one week before intervention, and should begins the treatment with insulin. The treatment with insulin continues during intervention and after intervention, until pulling out of sutures. Later on, the patient can treat with antidiabetic drugs, as before the procedure [18].
3. In acute stage of myocardial infarction and stroke. In these cases, treatment with insulin ameliorates local metabolic processes in myocardium and in brain. After passing of acute stage, patient can treat with antidiabetic drugs. It is necessary to underline that, in these cases the using of sulfonylureas and meglitinides drugs have to stop, because these drugs can cause hypoglycemia. On the other hand, hypoglycemia, itself, can cause abrupt increase of arterial hypertension, acute myocardial infarction and stroke [19].
4. In acute hepatitis. In this case the treatment with antidiabetic drugs should be stopped, to avoid other cell damages. After passing the acute stage, we can start the treatment with antidiabetic drugs, if the function of liver is normal, and hepatitis did not pass in chronic hepatitis [20].
5. In acute renal failure. In this case we have to stop the treatment with antidiabetic drugs with the intention of prevention other damages of renal cells. After passing of acute stage, it is possible to start the treatment with antidiabetic drugs again, if the kidney function is normal [21].
6. The treatment with insulin of type 2 diabetes mellitus is applied to the pa-

tients when the treatment with antidiabetic drugs. The treatment with insulin is temporarily, as a rule. Afterwords these patients can treat with antidiabetic drugs [21].

7. Temporaly treatment with insulin of type 2 diabetes is applied in patients who have miscellaneous febrile diseases. We can recommend the treatment with antidiabetic drugs, when the person recovers [22].

Permanent insulin mono therapy for the treatment of type 2 diabetes mellitus is prescribed in the following circumstances:

- When these pstients have chronic nephropathy with chronic renal failure (chronic renal disease) [23].
- When these pstients have chronic hepatitis or liver cirrhosis [20].
- When these patients have chronic decompensated heart failure [24, 25].
- When these diabetics have advanced microangiopathic, macroangiopathic, and neural complications.It is proved that the treatment with insulin has positive effect in course of chronic complications of diabetes [30, 34].

Combined treatment of type 2 diabetes mellitus with insulin and antidiabetic drugs is prescribed when the treatment with two or three antidiabetic drugs is ineffective. In these patients we can apply a long acting insulin, as glargine or levemir (detemir) [26, 28]. When we combine long acting insulins with sulfonylureas or meglitinides classes, it is necessary to keep in mind that patients can drop in hypoglycemia or hypoglycemic coma. In old patients hypoglycemia may be complicated with abrupt increase of arterial pressure, acute myocardial infarction, or stroke [26, 34].

Combined treatment of type 2diabetes mellitus, with insulin and antidiabetic drugs can be also prescribed intermediate acting insulins or biphasic acting insulins [25, 27]. Using of these insulins, it is possible to show hypoglycemia with its complications, as in using long acting insulins. During the hospitalization, insulin can be is applied under the skin, intramuscular or intravenous, but in out-patient conditions, insulin usually is applied subcutaneously.

1 — Rapid Acting Insulins

Rapid acting insulins are new insulins produced by genetic engeering technology. They are also called insulins analogues. They are Aspart Insulin, that is known as *Novo Rapid,* Glulisine Insulin, that is known as *Apidra* ,and Lispro Insulin, that is known as *Humalog.*

These insulins are used in monotherapy, and are very effective in treatment of acute hyperglycemias, hyperglycemic ketoacidotic comas, and hyperosmolar hyperglycemic nonketotic comas, because in these cases it is required rapid action insulin to save life of diabetic patients.

Authors of this article think that rapid acting insulins shoulsn´t been used in combinations with long acting insulins, intermediate acting insulins, or with biphasic insulins, because their action lasts 3–4 hours, despite of dosage. So, when a rapid acting insulin is done at 7,00 a.m., 10 minutes before breakfast, its action, despite of dosage, will finish at 11,00 a.m. Usually, the time for lunch is 2,00 p.m.

So, for three hours the diabetic patient has not a rapid acting insulin in the organism, but a long acting insulin only. In this situation the lack of a rapid acting insulin causes hyperglycemia. As a consequence diabetes will be deteriorated.

The same phenomenon is observed when a rapid acting insulin is done at 2,00 p.m., 10 minutes before lunch. The action of this insulin will finish at 6,00 p.m., despite of dosage. Usually, the time for dinner is 8,00 p.m. or 9,00 p.m. So, for two or three hours the diabetic patient has not a rapid acting insulin in the organism, but a long acting insulin only and, as a consequence, the glycemia will increas, so diabetes will be deteriorated.

From above explanation is clear that, an intermediate acting insulin, a biphasic acting insulin, or a long acting insulin, have to be combined with a short acting insulin [15, 19, 24, 26].

2 — Short Acting Insulins

They are *Neutral, actrapid, and insuman rapid* [15, 19, 24, 26].

3 — Intermediate Acting Insulins

They are *Insuman basal, Insulataard, humulin NPH; animal insulins with high purification: hypurine bovine, isophane, hypurine porcine isophane* [15, 19, 24, 26].

4 — Long Acting Insulins

They are *Glargine (lantus), detemir (levemir), zinc suspension, hypurine bovine lente.*

It is necessary to know that glargine insulin lantus detemir insulin levemir don´t have maximal acting point. So, these insulins do not cause hypoglycemia, and acute accidentsconnected with it [15, 19, 24, 26].

5 — Biphasic Insulins

These insulins are a mixture short acting insulin with in miscellaneous concentrations intermediate acting insulin. These insulins are called biphasic because their action is realised in two phases. In the first phase short acting insulin begins its action, while in the second phase intermediate insulin acts [15, 19, 24, 26].

They are *Novo Mix — 30, humalog mix 30, humalog mix 50; animal insulins with high purification — Hypurin porcine 30/70, humulin M3, insuman combi 15, insuman combi 25, insuman combi 50.*

Some insulin schemes for treatment of diabetes mellitus.

There are miscellaneous insulin schemes for treatment of diabetes mellitus. Some of them will be presented in this article.

When is available a short acting insulin only, this insulin is preseribed every 6 hours.

When is available an intermediate acting insulin only, this insulin is preseribed every 12 hours, in the morning and in the evening.

When is available a biphasic insulin only, this insulin is preseribed every 12 hours, in the morning and in the evening.

When is available a short acting insulin and an intermediate acting insulin, a short acting insulin is preseribed in morning and before the lunch, while an intermediate acting insulin is preserebed in the evening.

When are available a short acting insulin and a biphasic acting insulin, a short acting insulin is done in morning and in lunch, while a biphasic acting insulin is done in dinner.

When is available a short acting insulin and a long acting insulin, a short acting insulin is preseribed in the morning, before the lunch and before the dinner, while a long acting insulin is preserebed at 11 p.m

As a rule insulins are preserebed before each meal: Short acting insulins 20–30 minutes, intermediate acting insulins 1–2 hours, biphasic insulins 20–30 minutes, while long acting insulins, are done at 11 p.m. as mentioned above.

Rapid acting insulins, that are used to decrease high levels of glycemias, are preseribed at any time as mentioned above; these insulins are not depended from meal.

The dosage of insulin is depended on level of glycemia: before morning meal, before lunch meal and before dinner meal; two hours after morning meal, two hours after lunch meal and two hours after dinner meal, and at each time (at random).

Pancreatic ß-celles of persons secretes insulin in two manners: permanently, despite of meals, and immediately after any meal. Based on this fact it was produced special electronic device that mimic insulin secretion. These devices are called «insulin pumps». Insulin pumps are very expensive, so, many diabetics can´t buy them.

Instead of true insulin pumps, diabetic patients can use «poor men insulin pump», namely the combination of a short acting insulin with a long acting insulin as mentioned above. This special scheme is called «physiological scheme». We think that in «physiological scheme», the short acting insulin mimics the secretion of insulin from endocrine pancreas immediately after each meal, while the long acting insulin mimics permanently secretion of insulin from endocrine pancreas, despite of any meals.

This «physiological scheme» is used frequently by many authors [18, 19, 21, 23, 24, 26]. In some diabetics with diabetic hyperglycemic comas, is used a rapid acting insulin, or a short acting insulin, with an electric insulin syringe. When an electric syringe is not available, a rapid acting insulin, or a short acting insulin is given intravenous, with bolus or with liquids (Sol. Glucose 5 % or Sol. NaCl 0,9 %).

Clinical practice shows that insulin treatment of diabetics gives adverse effects: hypoglycemia, insulin allergy, lypodistrophies or atrophies of skin. These adverse effects are not object of this article.

THE TREATMENT OF DIABETES MELLITUS WITH ANTIDIABETIC DRUGS

The treatment of diabetes mellitus with antidiabetic drugs is the classical treatment of type 2diabetes mellitus.

In very rare cases, some antidiabetic drugs (biguanides or thiazolidinediones), may be used in patients with type 1 diabetes, together with insulin, temporarely, when these patients have insulin resistance. This treatment have to be stopped after the correction of insulin resistance, and, of course, the diabetic patient will continue the treatment with insulin only forever [17, 24, 26].

The treatment of diabetes with antidiabetic drugs aims to realize three main objectives:

A. The reduction of body weight when the patient is overweight, or obese, especially with abdominal obesity.
B. The increase of produce of insulin from beta cells, also, and the increase of efficacy of the insulin.
C. The decrease of high levels of glycemias to arrive equilibrium of diabetes [38, 39].

As mentioned above, the treatment of diabetes with antidiabetic drugs may be combined with insulin.

The treatment of type 2 diabetes with hypocaloric diabetic diet only in obese, particularly in very obese patients, were proved without success many years ago.[5]

Now, the treatment of type 2 diabetes is done combined with diabetic diet and antidiabetic drugs [6].

The classification of antidiabetic drugs is given in table 3 [26].

ANTIDIABETIC DRUGS THAT INCREASE SENSITIVITY TO INSULIN PRODUCED BY PANCREATIC BETA CELLS

Biguanides

The biguanide class includes metformin and fenformin. As we know, using of fenformin was stopped many years ago, because this drug

Table 3

The classification of antidiabetic drugs, based on their main mechanisms of action

Class of Antidiabetic Drugs	Place of Action	Main Mechanisms of Action
Biguanides Thiazolidinediones (Glitazones)	Mainly in the liver Mainly in peripheral tissues	Increase sensitivity to insulin produced by beta cells
Sulfonylureas drugs Meglitinides	In beta-cells	Increase production and secretion of insulin by beta cells
Inhibitors of Carbohydrates Suckling	In small intestine	Decrease suckling of glucose in small intestine
Incretins	In small intestine	Increase production of GLP-1 (Glucagon Like Peptide-1) and GIP(Glucose-Depending Insulinotropic Polypeptide). GLP-1 and GIP increase production and secretion of insulin by beta-cells, and inhibit production and secretion of glucagon by alpha-cells
Amylinomimetics	In small intestine	These medicaments have synergic activity with insulin, and inhibit production and secretion of glucagon

causes lactic acidosis, so, it is available metformin only. Metformin acts mainly in liver, inhibiting metabolic processes of glycogenolysis and glyconeogenesis. As we know, these processes cause hyperglycemia, and in diabetes mellitus these they are increased [2, 22, 34]. Many authors report that metformin increases sensitivity of insulin produced by pancreatic beta cells of endocrine [2, 22].

Metformin has also the following effects:

- Decreases figures of arterial pressure lightly. This is important, because about 70–80 % of patients with type 2 diabetes have arterial hypertension.
- Decrease figures of plasmatic triglycerides. This effect is realised by decrease of liver synthesis of VLDL and LDL lipoproteins.
- Some authors think that metformin increases HDL-cholesterol lightly. Metformin decreases appetite, dispatching in decrease of body weight. This is very important effect, because about 70 % of patients with type 2 diabetes are overweight or obese persons [22, 38]. The treatment of diabetes with metformin apparently decreases atherosclerotic damages of arteries with large and medium caliber, and as a consequence, decrease death of these patients from acute myocardial infarction and stroke [37].
- Metformin does not cause hypoglycemia [28, 38]. Metformin does not be used in male diabetics when level of creatinine in the blood is more than 1.5 mg / 100 ml, and in female diabetic patients when creatininemia is more than 1.4 mg / 100 ml [3, 4, 32]. Metformin does not be used, also, in diabetics of two genders with severe damages of liver, which appeared with increase of ALT (SGPT), AST (SGOT), and bilirubin [33, 44].

In clinical practice metformin can be used alone, but more frequently this drug is used combined with glibenclamide, pioglitazone, repaglinide, linagliptin, saxagliptin, acarbose, and insulin [26].

Metformin is available in tablets 500 mg, 850 mg, or 1000 mg [25, 33, 37].

Metformin is available as *glucophage, siofor,* or *metfomin* [26].

Clinical practice showed that during using of this drug, can have adverse effects: nausea, vomitus, diarrhea, and in very rare cases lactic acidosis [42, 43].

Thiazolidinediones (Glitazones)

Thiazolidinediones increase sensitivity to pancreatic insulin by beta cells in sceletal muscles and adipose tissue. These drugs show their pharmacological effects by binding and activationg selectively with PPAR-gama receptors.

These receptors are members of superfamily of peroxisome proliferator activated receptors — PPARs [23,38]. When these receptors are binding with substances or specific ligandes, it made possible the modulation of nucleus cell transcription factors [22, 24, 35]. The first used glitazone was *troglitazon*e. This drug is not available now, because it causes severe liver damages.

Now *pioglitazone* and *rosiglitazone* are available [26, 36].

When these drugs are used as monotherapy, each of them has the same hypoglycemic effect: HbA1c is decreased by 0.5–0.8 %. When each of them is used with insulin, the level of HbA1c is decreased by 0.7–1.4 % [40]. Some authors report that use of glitazones alone are ineffective in 20–50 % of diabetics. The clinical practice showed that the combination of glitazones with of sulfonylurea drugs is as much effective as the combination of metformin with of sulfonylurea drug.

Recent researches ascertanied that using of glitazones decrease the level of plasmatic triglycerides and LDL cholesterol, but increase the level of HDL cholesterol [39].

Many clinical studies show that glitazones decrease thickening of intima of arteries with large and medium caliber, normalize functions of endotelial tissue, decrease the figures of arterial tension, and ameliorate fibrinolytic and blood coagulation indicies [37, 41]. In patients with impaired glucose tolerance (IGT) these drugs ameliorate dynamics of beta cells insulin secretion. The using of glitazones decrease fat accumulation in liver, in visceral organes and intramyocellular, too [43].

The adverse effects of glitazones are the weight gain, the carrying of liquids in the body, the forming of edemas, and the display of blood

dilution, especially when glitazones are combined with sulfonylureas. These adverse effects are displaying when the treatment with these drugs lasts at least 12 months [35].

Thiazolidinediones are available as *pioglitazone* and *rosiglitazone,* in tablets 15 and 30 mg.

Some authors report that these drugs damage liver. So it have to explore hepatic function every 12 months [2, 3].

THE DRUGS THAT STIMULATE SECRETION OF INSULIN BY PANCREATIC BETA CELLS

Sulfonylureas drugs

These drugs are available since fifth decade of last century. They are classified in two generation. Sulfonylureas drugs act directly on pancreatic beta cells by blocking ATP — dependent potassium small channels. As a consequence of this action, it is occur increased influx of potassium ions to beta cells, causing increased production and secretion of insulin [3, 29]. Sulfonylureas drugs decrease level of glycemias by 60–70 %, but the level of HbA1c by 1.5–2.0 %.[4]

The data from United Kingdom Prospective Study (UKPDS), showed that it was not observed the increase of death from macrovascular accidents, particularly from ischemic heart disease (IHD) in diabetics treated with sulfonylureas drugs [37].

These drugs may cause cardiac arythmias, as a consequence of its direct action on SLR2 receptors [32, 45]. Some authors ascertaine that sulfonylureas drugs may decrease ischemic pain of myocardium [33, 46].

The clinical practice showes that these drugs cause adverse effects. The most severe is hypoglycemia, as a consequence of increased secretion of insulin, which caused by action of these drugs on pancreatic beta cells. It is important to mention that hypoglycemia may be the cause of stroke or acute myocardial infarction.

The other adverse effects of treatment with sulfonylureas drugs are: wheight gain, skin allergic reactions as erythema and exfoliative dermatitis, blood reactions as: leukopenia, agranulocytosis, trombocitopenia, pancitopenia, hemolitic anemia, or aplastic anemia [29].

Sulfonylureas drugs may be used in monotherapy, but more frequently these drugs are used with other drugs such as metformin, pioglitazone, rosiglitazone, incretine drugs (vildagliptin, sitagliptin, saxagliptin, linagliptin) acarbose and insulin.

When sulfonylureas drugs are used with insulin, we should be very careful because the risk of hipoglycemia is very high [26, 36]. Authors of this article think that probably it would be better not to combine sulphonylureas drugs with insulin, in order to avoid hypoglycemia. The treatment with sulfonylurea drugs should be stopped in diabetics who had or have acute myocardial infarction, in those who had or have stroke, and in patients with infection or trauma. These patients should be treat with insulin only [29, 32].

The sulfonylurea drugs do not use in diabetics with acute and chronic renal failure, in diabetics with liver damage increase of hepatic transaminases and bilirubin levels, and, in diabetics with acute porphyria [38, 40].

These drugs do not use in pregnant women, because they damage the fetus. These drugs do not use both in women who feed their infants with brest milk, because sulfonylureas drugs pass through milk to the child [39, 41].

The sulfonylureas drugs are available in tablets. The first generation drugs are: *acetohexamid — 500 mg, Chlorpropamide — 250 mg, tolazamide — 250 mg, tolbutamide — 1000 mg [3, 4].*

The second generation drugs are: *glibenclamid — 5 mg and 2.5 mg, gliclazide — 60 mg and 30 mg, glimepirid — 1–6 mg, glipizid — 5 mg* [26, 35].

Meglitinides

Meglitinides drugs, as sulfonylureas, act directly on pancreatic beta cells, on SUR 1 receptors, blocking ATP-channels. As a consequence of this blocking, the influx of calcium ions is increased, so the beta cells produce and secrete insulin [29, 33].

There are available two drugs: *repaglinide* and *nateglinide.*

Repaglinide acts fast, but its half-time is short. This drug is taken at meal time. Repaglinide decreases fasting glycemia as glibenclamid does, but postprandial glycemia decrease more than fasting one. In comparison with glibenclamid, repaglinide causes less

hypoglycemia and less weight gain as glibenclamid does. Some authors report that the combination of glibenclamid with repaglinide is more effective as each of them [26, 37, 38]. Maximal doses of repaglinide have a little advantage in comparison with its average doses. This phenomenon is the same, as for sulfonylureas drugs [32].

Nateglinide acts more rapid as repaglinide does, but its prolongation of acting is more short than prolongation of repaglinide is [36]. Some authors report that nateglinide decreases postprandial glycemia more than fasting glycemia [33]. Hypoglycemia from using of meglitinides is less expressive than from sulfonylureas drugs. This characteristic made possible to use of meglitinides in older diabetics and in diabetics with diabetic autonome neuropathy more frequently, in order to avoid this severe acute complication of diabetes mellitus in these diabetics [40, 41].

In clinical practice the use of meglitinides drug alone is rare; more frequently these drugs are used in combination with drugs that increase sensitivity to pancreatic insulin beta cells (metformin, pioglitazone, rosiglitasone), or are used with long acting and intermediate acting insulins, but carefully [33, 41].

Repaglinide and *nateglinide* are available in tablets 0.5, 1 and 2 mg [26, 44].

Adverse effects of meglitinides are the same as those of sulfonylureas, but less expressive.

INHIBITORS OF CARBOHYDRATES SUCKLING

The inhibitors of carbohydrates suckling inhibit activity of amylase enzyme which decomposes polysaccharides, and, inhibit also activity of enzymes which decompose disaccharides, too [45].

As a consequence of non decomposition of polysaccharides and disaccharides, the suckling of glucose from small intenstine decreases, so the level of glycemia descends [46]. Inhibitors of carbohydrates are effective when they are taken together with meal; they do not act when stomach and intestine are empty [33].

There are available the following drugs: *acarbose, glucobay, miglitol and voglibose* [26, 29]. The treatment with acarbose decreases level of HbA1c by 0.5–1.0 %, levels of glycemias before meals decrease by 10–20 %, while level of postprandial glycemias decrease by 30–50 %. The same effects have other drugs of this class [35, 36].

The dose of these drugs should be picked up carefully. First very small doses are used, which are gradually increased. High first doses may causes gastrointestinal discomfort and malabsorbtion of carbohydrates from small intestine [32]. When these drugs are used alone, they do not cause hypoglycemia and do not affect body weight [29]. It is necessary to know that miglitol and voglibiose do not inhibit amylase which inhibits polysaccharides as acarbose does, but they inhibit enzymes that decompose disaccharides [38]. In reference to adverse effects, we mention flatulence (increased presence of gases in intenstine), and great loss of excrements, as a consequence of diarrhea caused by these drugs [40].

When these drugs are used with insulin or sulfonylureas drugs, it may be presented hypoglycemia, as a consequence of liver damage. Treatment with drugs that inhibit carbohydrates suckling, needs to control liver function tests [41].

Inhibitors of carbohydrates suckling are not indicated in diabetics with inflammatory diseases of intenstine, intestinal obstruction, hernias, and in those diabetics who been done surgical interventions in abdomen, clarifying the diagnosis before and after surgical interventions [26, 38].

Acarbose, glucobay, miglitol and *voglibiose a*re available in tablets 500 mg [26, 38].

INCRETINS

Incretins are substances that are produced in small intestine. These substances stimulate producing of insulin by pancreatic beta cells much more than glucose administered intravenously does [35]. In human these substances are GLP-1 (Glucagon Like Peptide-1), and GIP (Glucose-Dependent Insulinotropic Polypeptide) [42]. The GLP-1 substance is produced by small intestinal cells by genetic code that transmits proglucagon gen. GLP-1 is produced immediately after getting meals [37]. During the time when food is in small intestine, GLP-1 stimulates the producing and the secretion of insulin by pancreatic beta [32].

GLP-1 inhibits and decreases hyperglycemia caused by nutritive substances, retards stomach emptying, decreases appetite and ameliorates satiety feeling [33]. GLP-1 causes proliferation of pancreatic beta cells and protects cells against apoptosis [37]. GLP-1 inhibits producing of glucagon by pancreatic alpha cells [42].

Plasmatic half time of GLP-1 is very short, fromone to two minutes. In physiological conditions GLP-1 is destroyed by dipeptidyl-peptidase-IV (DPP-IV) [38]. Recently pharmacological agents which increase produce and secretion of GLP-1 substance have been produced. These drugs make possible the increasing of insulin producing and secretion of by pancreatic beta cells consequently equilibrium the diabetes [26, 38].

Incretin medicaments are grouped in two main classes:

A. Incretinomimetics. These medicaments increase the producing and secretion of GLP-1. It goes without saying that increased producing and secretion of insulin will compensate the diabetes [42].

B. Inhibitors of dipeptidyl-peptidase (DPP-IV) enzyme. These medicaments inhibit DPP-IV enzyme, make possible non destruction or little destruction of GLP-1, and as a consequence, GLP-1 substance presents in small intestine longer time, making possible producing and secretion of insulin by pancreatic beta cells. On the other hand, it is well known that increase of insulin secretion makes possible to counter balance of diabetes.

A — Incretinomimetcs

These are similiar to incretins. One of this drugs is *liraglutide*. This medicament is injected subcutaneously, once a day [43]. Liraglutide is resistant to DPP-IV action, so, producing and secretion of insulin continue, and of course, high levels of glycemia decrease [44].

The clinical practice showed that exenatide (inhibitor of dipeptidyl peptidase (DPP-4), and liraglutide, almost equally reducehigh level of HbA1c [35].

On the other hand, liraglutide reduces postprandial glycemia more than exenatide does. Liraglutide causes less nausea than exenatide does [44].

B — Inhibitors of dipeptidyl-peptidase (DPP-IV) enzyme

Dipeptidyl-peptidase enzyme in physiological conditions is produced in small intestine. As we mentioned above, this enzyme destroys GLP-1 and GIP substances [42].

Exendin-4 is a natural component of the saliva of the *Gila monster* (*Heloderma suspectum*), and shares 53 % sequence identity with GLP-1 [43]. Exendin-4 is resistant to destructive action of DPP-IV enzyme [39].

Exenatide is a synthetic analogue of exendin-4. This medicament (exenatide — 4) inhibits destructive action of DPP-IV enzyme. As consequence of this inhibition, plasmatic half time of GLP-1 is prolonged, leading to producing and secretion of insulin by pancreatic beta cells and to equilibrium of diabetes [26].

Exenatide is resistant to destructive action of DPP-IV enzyme [39]. Exenatide is injected subcutaneously. As a consequence of injection, the plasmatic half time of GLP-1 is prolonged till two hours. It is necessary to know that in physiological condition, plasmatic half time of GLP-1 is one to two minutes [35]. Exenatide can be combined with metformin, sulfonylurea drugs, or glitazones [35, 37].

Exenatide is given 5–10 microgram, twice a day, every 12 hours, injected under the skin [26]. Concerning biological effects, exenatide decreases HbA1c up to 1 %. Exenatide lowers postprandial glycemia more than fasting one glycemia [47].

The treatment with exenatide decreases body wheight by 0.5–1.0 kg per month, compared with patients treated with placebo [43]. Concerning adverse effects, nausea is the most frequent. This adverse effect, is appeared since beginning of treatment with this drug in 40–50 % of patients [42].

The clinical practice showed that combination of exenatide with metformin causes less hypoglycemia that combination of exanatide with sulfonylurea drugs. In the case of combination with sulfonylureas, you have to low doses of exenatide to avoid hypoglycemias [35, 44].

Lately there oral medicaments that inhibit DPP-4 enzyme. These medicines replaced exenatide, because their action are longer than action of exenatide.

The first drugs were *vildagliptin* and *sitagliptin*. These medicaments reduce increased levels of HbA1c by 0.7 %.[44]

Lately available new medicines of this class: *linagliptin* and *saxagliptin* [26].

As exenatide, vildagliptin, sitagliptin, linagliptin and saxagliptin, may be combined with metformin, sulfonylureas and glitazones drugs [26, 47].

Lately is available a drug which contains of vildagliptin-50 mg and metformin-500 mg. This medicament is called *Galvus-Met 50/500* [26].

It is necessary to be careful for diabetics who had or have pancreatitis, renal damages and damages of liver while using the inhibitors of DPP-4 enzyme [40, 41]. Incretinomimetics and DPP-4 enzyme inhibitor drugs do not use in diabetics who had or have ketoacidosis, and in all diabetics who had or have those diseases that do not permit using of the drugs for treatment of type 2 diabetes, mentioned above. Concerning adverse effects, those are similiar with adverse effects of antidiabetic drugs that are using for treatment of type 2 diabetes, mentioned above [26, 39].

AMYLINOMIMETICS

Amylin is a neuroendocrine hormon that is secreted by pancreatic beta cells, both with insulin. It is proved that amylin deficiency, as insulin deficiency, is presented in two types of diabetes mellitus: the absolute deficiency in type 1 diabetes while in type 2 diabetes there is relative deficiency [24, 33].

The secretion of amylin is dependent on the level of glycemias, similiarly as secretion of insulin. Amylin acts on central nervous system, favouring satiety, decreasing appetite, and through vagal nerve causes decrease of stomach emptying.

Amylin inhibits glucagon secretion [35, 47]. *Pramlintide* is a synthetic analog of amyline, that does not digest in water, does not aggregate and is equivalent with it. This medicament is used in diabetics of both diabetic types who are treated with insulin only, with drugs, or with drugs and insulin. In diabetics with type 2 diabetes, use of pramlintide decreases HbA1c by 0.5–0.7 %, and reduces body weight by 0.5–1.0 kg per month [24].

Pramlintide is injected under the skin, at meal time, three times a day. Concerning dosage, we can begin with 60 microgram, with gradually increasing to *120 microgram* [26, 47]. Nausea is usual adverse effect that gradually passes. Concerning hypoglycemia, it is more frequent in petients with type 2 diabetes than those with type 1 diabetes [37]. *Pramlintide* is available *in flacons* which contain *60 microgram* of this drug.

When diabetics of both types are treated with pramlintide and insulin, to avoid possible hypoglycemias, it is necessary to decrease dosage of insulin at 50 % [38, 47].

Thus, The data presented in the article characterize the state of the problem of diagnosis and treatment of diabetes mellitus in Albania.

REFERENCES

1. WHO. Definition, Diagnosis and Classification of Diabetes Mellitus and Its Complications. Part 1. Diagnosis and Classification, *Geneva*, 1999.
2. Feling Ph, et al. Diabetes Mellitus. In book: Endocrinology and Metabolism. Third Edition, Ed. by Ph. Feling, et al., *Mc.Graw-Hill*, 1955: 1107-1250.
3. Foster DW. Diabetes Mellitus. In book: Harrison's Principles of Internal Medicine, Ed. Fauci, et al., 14-th Ed, 1998; 2: 2020-2080.
4. Garber AL. Diabetes Mellitus. In book: Internal Medicine, Ed. JH. Stein, *Mosby*, 4-th Ed, 1994: 1391-1423.
5. Bray GA. Obesity. In book: Current Therapy in Endocrinology and Metabolism, Ed. C. Wayne, MD. Bardin, *Mosby*, 1994: 465-474.
6. Sunyer XP. Treatment of Obesity. In book: Joslin's Diabetes Mellitus. Ed. C. Ronald Khan, et al., 14-th Ed., *Lippincot and Wilkins,* 2005: 547-562.
7. Agaci F. What are basic criteria for compile the diabetic diet for each diabetic patient. In book: Bisede per diabetin e sheqerit, *Ombra GVG. Tirane*, 2006: 220-221.
8. Judith Wylie-Rosset. Diet Therapy. In book: Clinical Guide to Diabetes Mellitus. Ed. Karl E. Sussman, et. al., *New-York,* 1987: 47-58.
9. Marynik MD. Medical Nutrition Therapy in Diabetes. Clinical Guidlines for Primary Care Physicians. In book: Medical Management of Diabetes Mellitus, Ed. L. Lealy, et al., *Marcel Dekker,* 2000: 235-254.
10. Agaci F. How to determine the type of Diabetes Mellitus. In book: Conversation on Diabetes Melitus, *Ombra GVG. Tirane,* 2006: 217.
11. Mc Mahon MM. Nutritional Support in the Diabetic Patient. In book: Medical management of Diabetes Mellitus, Ed. L. Lealy, et al., *Marcel Decker,* 2000: 641-654.

12. Vink AI, et al. Nutritional Management of the Person with Diabetes. In book: Ellenberg and Rifkins Diabetes Mellitus. Ed. Daniel Porte JrMD, et al., *Appelton and Lange*, 5-th Ed, 1997: 609-652.

13. Crapo PhA. Dietary Management. In book: Joslins, Diabetes Mellitus. Ed. C. Ronald Kahn, et al. Thirteen Edition, *Lea and Febiger*, 1994: 415-430.

14. Kalo I. Diabeti, *Tirane*, 1985.

15. Cheng AYY, et al. Principles of Insulin Therapy. In book: Principles of Insulin Therapy. Ne Librin : Joslin,s Diabetes Mellitus. Fourteenth Edition, Ed. C. Ronald Kahn, et al., *Lippincot and Wilkins*, 2005: 659-670.

16. Agaci F. What are Indications for Treatment of Diabetes Mellitus whith Insulin. In book: Conversation on Diabetes Mellitus, *Ombra GVG. Tirane,* 2005: 237-239.

17. Beisswenger PJ. Type 1 Diabetes. In book: Medical Management of Diabetes Mellitus, Ed. Jack L. Lealy, et al., *Marcel Dekker,* 2000: 95-114.

18. Arslanian S, et al. Insulin Dependent Diabetes Mellitus in Children and Adolescents. In book: Current Therapz in Endcrinology and Metabolism, Ed. C.Wayane *Bardin M.D.Mosby*, 1994: 380-383.

19. Kennedy FP. Insulin Therapy. In book: Management of Diabetes Mellitus, Ed. Jack L. Lealy, et al., *Marcel Dekker,* 2000: 573-582.

20. Mosses AC, et al. Approaches to Insulin Therapy and Recent Advances in Implantable Glucose Sensors. In book: Joslin,s Diabetes Mellitus. Thirteenth Edition, Ed. C. Ronald Kahn, et al., *Lea and Febiger*, 1994: 570-585.

21. Strowing SM, et al. Intensive management of Insulin Dependent Diabetes Mellitus. In book: Ellenberg and Rifskin Diabetes Mellitus. Fifth Edirion, Ed. Daniel Porte Jr. MD, et al., *Appelton and Lange*, 1997: 709-734.

22. Bergenstal RM, et al. Diabetes Mellitus Therapy. In book: Endocrinology. Vol. 2. Third Edition, Ed. Leslie de Groot. WB., *Saundres Company,* 1995: 1482-1505.

23. Rosenveig LJ, et al. Principles of Insulin Therapy. In book: Diabetes Mellitus. Thirteenth Edition, Ed. C. Ronald Kahn, et al., *Lea and Febiger*, 1994: 460-488.

24. Masharani U, et al. Pancreatic Hormones and Diabetes Mellitus. In book: Greenspan,s Basic and Clinical Endocrinology. Eighth Edition, Ed. DG. Gardner, et al., *Mc Graw Hill*, 2007: 661-747.

25. Cheng AYY, et al. Principles of Insulin Therapy. In book: Joslin,s Diabetes Mellitus. Fourteenth Edition, Ed. C. Ronald Kahn, et al., *Lippincot Williams and Wilkins*, 2005: 659-670.

26. B.N.F. *Endocrine System,* March-September 2014: 448-467.

27. Davidson MB. Insulin Therapy. In book: Clinical Guide to Diabetes Mellitus, Ed. Karl E. Sussman, et al.. *New York*, 1987: 15-32.

28. Struwing SM, et al. Intensive Management of Insulin Dependent Diabetes Mellitus. In book: Ellenberg and Rifkins Diabetes Mellitus. Fifth Edition, Ed. Daniel Porte Jr, et al., *Appelton and Lange*, 1997: 709-734.

29. Coopan R. General Approach to the Treatment of Diabetes. In book: Joslin,s Diabetes Mellitus.Thirteenth Edition, Ed. C. Ronald Kahn, et al., *Lea and Febiger*, 1994: 397-403.

30. Rosenweig LJ, et al. Principles of Insulin Therapy. In book: Joslin,s Diabetes Mellitus. Thirteenth Edirion, Ed. C. Ronald Kahn, et al., *Lea and Febiger,* 1994: 460-488.

31. Edelman SV. Insulin Pump Therapy *: A Practical Tool for Treating Persons with Type 1 and Insulin Requiring Type 2 Diabetes.* In book: Medical Management of Diabetes Mellitus, Ed. Jack L. Lealy, et al., *Marcel Dekker,* 2000: 309-329.

32. Coopan R. General Approach to the Treatment of Diabetes. In book: Joslin,s Diabetes Mellitus. Thirteenth Edition, Ed. C. Ronald Kahn, et al, *Lea and Febiger*, 1994: 397-403.

33. Coopan R. General Approach to the Treatment of Diabetes Mellitus. In book: Joslin,s Diabetes Mellitus Fourteenth Edition, Ed. C. Ronaid Kahn, et al., *Lippincot Williams and Willkins*, 2005: 587-596.

34. Davis JN, et al. Insulin, Oral Hypoglicemic Agents, and the Pharmacology of Endocrine Pancreas. In book: Goodman and Gilman,s The Phermacological Bases of Therapeutics. Nineteenth Edition, *McGraw Hill*, 1996: 1487-1518.

35. Inzucchi SE. *JAMA* 2002; 287: 360-372. doi.org/10.1001/jama.287.3.360

36. Kolterman OG. The Use of Oral Hypoglicemic Agents in the Management of Type II Diabetes. In book: Clinical Guide to Diabetes Mellitus, Ed. KE. Sussman, *Alan R. Liss*, 1987: 33-46.

37. Cheade J, et al. *Drugs* 2000;60: 95-113. doi.org/10.2165/00003495-200060010-00006

38. Ahmann AJ, et al. Oral Pharmacological Agents. In book: Medical Management of Diabetes Mellitus. Ne Librin: Medical Management of Diabetes Mellitus, Ed. Jack L. Lealy, et al., *Marcel Dekker*, 2000: 267-284.

39. Buse JB, et al. Type 2 Diabetes Mellitus. In book: William,s Textbook Of Endocrinology. Eleveenth Edition, Ed. HM. Kronenberg, et al., *Saunders,* 2008: 1329-1390.

40. Foster DW. Diabetes Mellitus. In book: Harrison, Principles of Internal Medicine. Thirteen Edition, Ed. Isselbacher, et al., 1997; 2: 1979-1999.

41. Bergenstal RM, et al. Diabetes Mellitus Therapy. In book: Endocrinology. Third Edition, Ed. Leslie De Groot WB, *Saunders Company*, 1995; 2: 1482-1505.

42. Lebovitz HL. Management of Hyperglicemia with Oral Antihyperglicemic Agents in Type 2 Diabetes. In book: Joslin,s Diabetes Mellitus. Fourteenth Edition, Ed. C. Ronald Kahn, et al., *Lippincot Williams and Wilkins*, 2005: 687-710.

43. Lealy. Type 2 Diabetes. In book: Medical Management of Diabetes Mellitus, Ed. Jack L, et al., *Marcel Dekker*, 2000: 115-150.

44. Buse JB, et al. Type 2 Diabetes. In book: William,s Textbook of Endocrinology. Tenth Edition, Ed. P. Reed Larsen, *Saunders*, 2003: 1427-1484.

45. Blackard WG, et al. Non Insulin Dependent Diabetes Mellitus. In book: Currnt Therapy in Endocrinology and Metabolism, Ed. C. Wayne Bardin MD, *Mosby*, 1994: 380-383.

46. Lebovitz HL. Oral Antidiabetic Agents. In book: Joslin,s Diabetes Mellitus. Thirteenth Edition, Ed. C. Ronald Kahn, et al., *Lea and Febiger*, 1994: 508-529.

47. Lebovitz HL. Management of Hiperglycemia With Oral Antihyperglycemic Agents in Type 2 Diabetes. In book: Joslin,s Diabetes Mellitus. Fourteenth Edition, Ed. C. Ronald Kahn, et al., *Lippincot Williams and Wilkins*, 2005: 687-710.

ПРИНЦИПЫ ТЕРАПИИ САХАРНОГО ДИАБЕТА С ПРИМЕНЕНИЕМ ДИЕТЫ, ИНСУЛИНА И САХАРОСНИЖАЮЩИЙ ПРЕПАРАТОВ

F. Agaçi[1], A. Sadedini[1], Y. Themeli[2], E. Çelo[2]

[1] University Hospital «Shefqet Ndroqi», Diabetic Foot Unit, Tirana, Albania
[2] University Hospital «Mother Teresa», Service of Endocrinology and Diabetes, Tirana, Albania
f_agaci@yahoo.com

Обзорная статья посвящена вопросам лечения сахарного диабета. Приведены литературные данные относительно использования сахароснижающих агентов в албанской популяции.

Ключевые слова: сахарный диабет, инсулин, таблетированные сахароснижающие препараты.

ПРИНЦИПИ ТЕРАПІЇ ЦУКРОВОГО ДІАБЕТУ З ВИКОРИСТАННЯМ ДІЄТИ, ІНСУЛІНУ ТА ЦУКРОЗНИЖУВАЛЬНИХ ПРЕПАРАТІВ

F. Agaçi[1], A. Sadedini[1], Y. Themeli[2], E. Çelo[2]

[1] University Hospital «Shefqet Ndroqi», Diabetic Foot Unit, Tirana, Albania
[2] University Hospital «Mother Teresa», Service of Endocrinology and Diabetes, Tirana, Albania
f_agaci@yahoo.com

Оглядова стаття присвячена питанням лікування цукрового діабету. Наведені літературні дані щодо використання цукрознижувальних агентів в албанській популяції.

Ключові слова: цукровий діабет, інсулін, таблетовані цукрознижуючі препарати.

THE PRINCIPLES OF TREATMENT OF DIABETES MELLITUS WITH DIET, INSULIN AND ANTIDIABETIC DRUGS

F. Agaçi[1], A. Sadedini[1], Y. Themeli[2], E. Çelo[2]

[1] University Hospital «Shefqet Ndroqi», Diabetic Foot Unit, Tirana, Albania
[2] University Hospital «Mother Teresa», Service of Endocrinology and Diabetes, Tirana, Albania
f_agaci@yahoo.com

This literary review is sanctified to the questions of treatment of diabetes mellitus. Literary data about using of hypoglycemic agents in the Albanian population are given in the article.

Key words: diabetes mellitus, inculin, tableted hypoglycemic drugs.