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THE PREVALANCE OF HYPERLIPIDEMIA IN TYPE 2 DIABETES, DIABETIC CARDIOMYOPATHY AND/OR DIABETIC KIDNEY DISEASE

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INTRODUCTION

Type 2 diabetes appears on the basis of a combined interaction of some genetic susceptibility factors, with some predisposed environmental factors (obesity, sedentary, stress, pathological nutrition) (Serban V., 2010). Strictly from the genetic point of view, type 2 diabetes is a polygenic affection with numerous diabetogenic genic variants but also protective (Serban V., 2010, Barosso I et al, 2005, Grigorescu F. et al 2010).

Type 2 diabetes appears after an imbalance between the insulin secretion and insulin resistance (IR), the first being altered by the existence of some anomalies, secretors of ß cell (reduction of muscular mass, alteration of insulin secretion pattern in basal conditions, glucose's reduced capacity of modulating the insulin answer, the weak conversion of proinsulin into insulin) (Serban V., 2010, Gerich J.E et al, 2003, Utzchneider K. et al, 2004).

IR it is defined as insulin's incapacity, in the seric concentration observed in healthy subjects, of producing the same biological effects in the tissues, especially in the skeletal muscle, adipose tissue and liver (Serban V., 2010).

Glucose homeostasis, as well in postabsorptive state (a jeun) as after alimentary ingestion (postprandial), it is "centrally" influenced by the insulin secretion and glucagon, and "peripherally" by the sensitivity of the tissues object to insulin action. Their affection shows major deficiencies obvious in the clinic phase of type 2 diabetes, which sets off a true pathological cascade (anomalies of hepatic production and glucose tissular captation, adipose tissue metabolism and free fatty acids anomalies), which sits at he basis of a jeun and postprandial hyperglycemia, specific to diabetes (Ionescu-Tîrgovişte C. et al, 2004).

In comparison to healthy subjects, patients suffering of type 2 diabetes show high levels of free fatty acids (FFA), due to the IR effect of the adipose tissue. FFA circulating level increasement has multiple effects (Ionescu-Tîrgovişte C. et al, 2004, Krentz A.J. et al, 1996):

- At the level of skeletal muscle, most of the cases determine IR, by lowering the glucose captation (glucose-fatty acids cycle)
- The accumulation of triglycerides at the level of skeleton tissues determines insulin resistance increasement
- At the liver level, FFA stimulates gluconeogenesis's key enzymes and therefore PHG
- The increase of the circulating level of FFA rises the hepatic production of endogenous triglycerides (VLDL), relation strongly influenced by the insulin level which favours the esterification of FFA in hepatocyte's cytoplasm.

The pathogenic complex is always influenced by genetic factors, age, personal hystory of the subject or specific lifestyle components (Bala C. et al 2009, DeFronzo R.A. et al, 2009).

A part of this pathogenic mecanism is predominantly active in the production of microangiopathy, another part intervening in the induction of macroangiopathy. A series of risk factors are somehow charactistic to the clinical action of micro- or macroangiopathy, of which we can mention the disorder of lipid metabolism (Bala C. et al 2009).

Dyslipidemias, in general, but especially hyperchilesterolemia, are arteroclerosis's risk factors, process which, is well know as being the main cause of death, in countries with a good or very good economic level (Serban V., 2011, Nathan D.M. et al 2008).

On the other hand, uncontroled diabetes is known to be a risk factor in hyperlipidemias' appereance, with direct effect on the increase of cardiovascular risk, the result being high prevalence in general population (Serban V., 2011, Davidson M.H., 2007, Rutter M.K. et al, 2006, Ahmad L.A. et al, 2010, Moşuţan C. et al, 2011).

MATERIAL AND METHODS

Under study have been taken blood samples from four groups diagnosed with type 2 diabetes, hospitalized at County Clinical Hospital Oradea between 2010 2011, among whom:

-Group 1 39 diabetics without diabetic cardiomyopathy and without diabetic kidney disease-control group

-Group 2 32 diabetics without diabetic cardiomyopathy and with diabetic kidney disease

- Group 3 37 diabetics with diabetic cardiomyopathy and without diabetic kidney disease

- Group 4 19 diabetics with diabetic cardiomyopathy and with diabetic kidney disease

Determination of glycated hemoglobin - HbA1c: glycated hemoglobin is a marker of chronic hyperglycemias. It is a precise imagine of the glucemic control for a period of 3-4 months. Glycated hemoglobin is the result of hemoglobin's nonenzymatic glycation and its value is proportional to hyperglycemia's level and length.

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The reaction has as its base glucose's interaction with the amino group from the peptidic chain determining the forming of the Schiff base or aldimine. This is a quick and irreversable reaction. If hyperglycemia is maintained for a longer period of time, aldimine shall be transformed into ketoamine. The reaction is slow and irreversible (Serban V., 2010) .

Method's criterion: the determination is done from venous blood mixed with anticoagulant. Hemoglobin A1c it is done from hemolyze thourgh immunoturbidimetry and total hemoglobin is determined also from hemolyzed through colorimetry method, with alkaline haematin. The samples are photometered at 550 nm.

The values considered normal in non diabetic subjects are between 4 6%. In diabetics' case the values between 6 7.5% show an excelent metabolic equilibrium (Serban V., 2010).

In type 2 diabetes different medical associations propose different values for HbA1c :

ADA (American Diabetes Association) < 7%

EASD (European Association for the Study of Diabetes and IDF Europa (International Diabetes Federation) ≤ 6,5% (Silink M., Mbanya J. C., 2007)

Lipid profile study: it was determined within the study cholesterol's and triglycerides' value as well as HDL cholesterol and LDL cholesterol.

Cholesterol determination was done according to the enzymatic method. The method has at its base the fact that in watery environment cholesterol esterase decomposes cholesterol ester in cholesterol and fatty acid. Cholesterole in the presence of oxygen, is oxidized by the cholesterol oxidase with the forming of cholesten and hydrogen peroxide. Hydrogen peroxide together with phenol and 4-aminoantipyrine forms, in the presence of peroxidase, red chinolone and water. The samples are photometered afterwards at 505 nm.

We considered normal, a value of serum cholesterol lower than 200 mg/dl (Serban V., 2011).

Serum triglycerides determination was done from venous plasma, still thourgh an enzymatic method. The determination method has at its basis the following principle: lipase decomposes the triglycerides in glycerol and fatty acids. Glycerol together with ATP under the action of glycerol kinase in the presence of magnesium ion transforms in glycerol 3-phosphate and ADP. Glycerol 3-phosphate is oxidized under the action of glycerol phosphate oxidase at dihydroxyacetone with the forming of hydrogen peroxide. The latter reacts with 4-aminoantipyrine and with ADP and under the action of peroxidase forms red chinolone and water. The samples are then photometered at 546 nm.

The values considered normal for triglycerides are those lower than 150 mg/dl (Serban V., 2011).

HDL cholesterol determination it is done from the supernatant obtained by the selective precipitation of other lipid fractions (LDL, VLDL, chylomicron). By spinning it is obtained a clear supernatant after which for the determination of HDL cholesterol shall be followed the same steps as for cholesterol determination. We considered as being a normal a value of HDL-cholesterol higher that 40 mg/dl (Serban V., 2011).

For calculating LDL cholesterol it was used Friedewald's formula (Serban V., 2011).

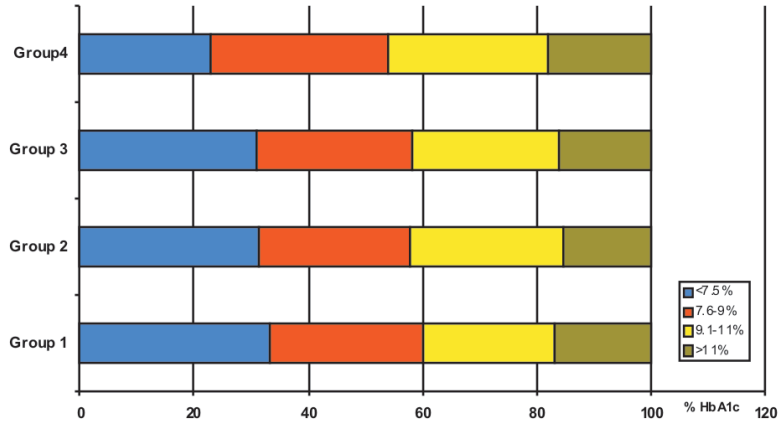
LDL-col (mg %) =TC-HDL col-TG: 5

(where TC = total cholesterol, TG=triglycerides)

The normal value is considered to be a value lower than 100 mg/ dl (Serban V., 2011).

RESULTS AND DISCUSSIONS

The majority of cases (83.5%) presented HbA1c values between 7% and 11%, a clear metabolic disequilibrium being perceived, especially, in the samples observed pertaining to group 4, where there are present both chronic complications (Figure 1).



	Group 1	Group 2	Group 3	Group4
>11%	16.7	15.6	16.2	17.9
9.1-11%	23.1	26.6	25.7	28.2
7.6-9%	26.9	26.6	27	30.8
<7.5%	33.3	31.3	31.1	23.1

Fig. 1 Percentage distribution of HbA1c values

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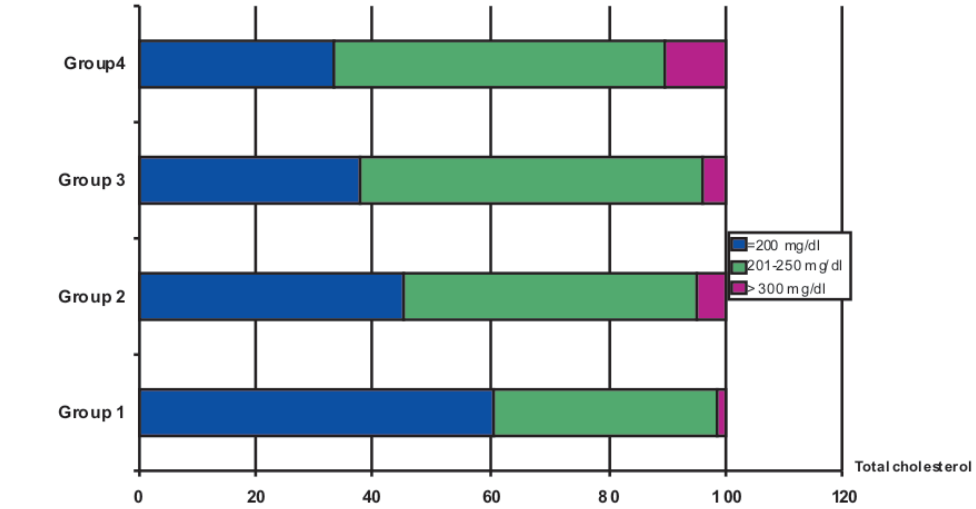
As it can be observed in Figure 2, the percentage report between the values of total cholesterol (normal value %/ hypercholesterolemia %) is aproximate equal, high percentage values (>50%) being encoutered in groups 2, 3 and 4, where are present one or both chronic complications.

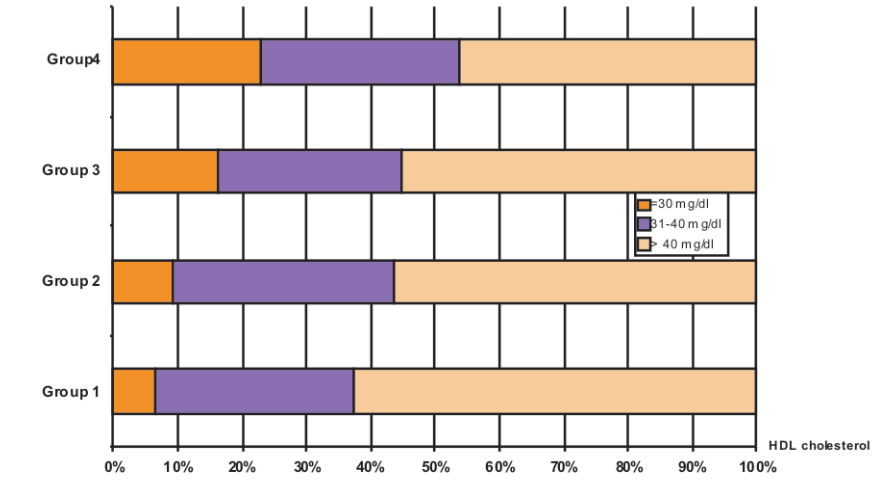


	Group 1	Group 2	Group 3	Group 4
>300 mg/dl	1.3	4.7	4.1	10.3
201-250 mg/dl	38.5	50	58.1	56.4
=200 mg/dl	60.3	45.3	37.8	33.3

Fig. 2 Percentage distribution of total cholesterol values

Severe hypercholesterolemia (>300 mg/dl) was present only in 10.3% of the cases, most of the samples pertaining to group 4.

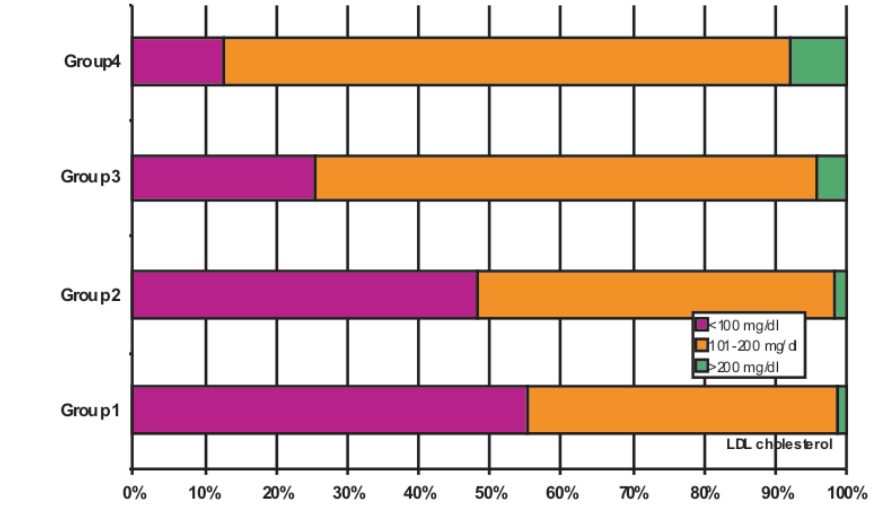
The values of HDL cholesterol did not show signigicant modifications in groups 2, 3 and 4, in comparison to the control group 1 (Figure 3).



	Group 1	Group 2	Group 3	Group4
> 40 mg/dl	62.8	56.3	55.4	46.2
31-40 mg/dl	30.8	34.4	28.4	30.8
=30 mg/dl	6.4	9.4	16.2	23.1

Fig. 3 Percentage distribution of HDL cholesterol values

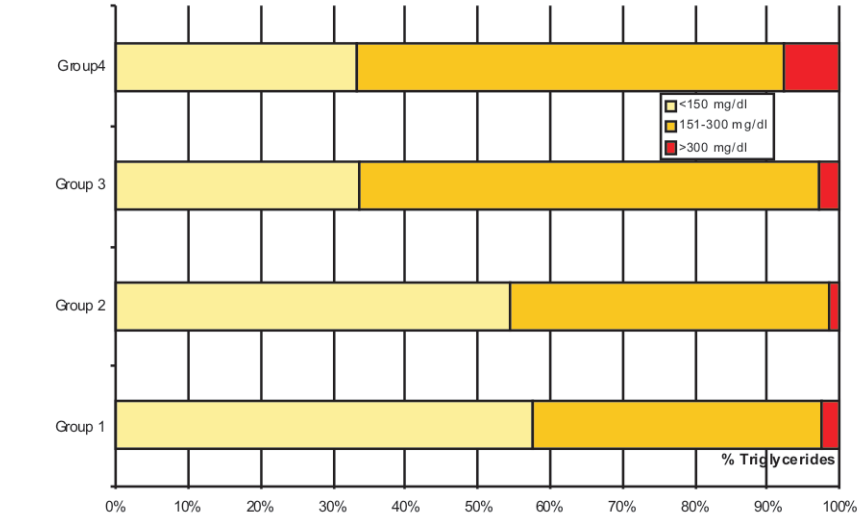
As it can be observed in the graphic above, LDL cholesterol was high in most of the samples, a noticible difference being observed between the witness group and group 4, where both chronic complications appear (Figure 4).



	Group 1	Group 2	Group 3	Group 4
>200 mg/dl	1.3	1.6	4.1	7.7
101-200 mg/dl	43.6	50	70.3	79.5
<100 mg/dl	55.1	48.4	25.7	12.8

Fig. 4 Percentage distribution of LDL cholesterol values

Triglycerides were high in all 4 groups, most of the cases showing values between 151 mg-dl and 300 mg/dl, severe hypercholesterolemia being observed in 3.1% of the all samples, most of the samples pertaining to the group with diabetic cardiomyopathy and with diabetic kidney disease (Figures 5 and 6).



	Group 1	Group 2	Group 3	Group4
>300 mg/dl	2.6	1.6	2.7	7.7
151-300 mg/dl	39.7	43.8	63.5	59
<150 mg/dl	57.7	54.7	33.8	33.3

Fig. 5 Percentage distribution of triglycerides values

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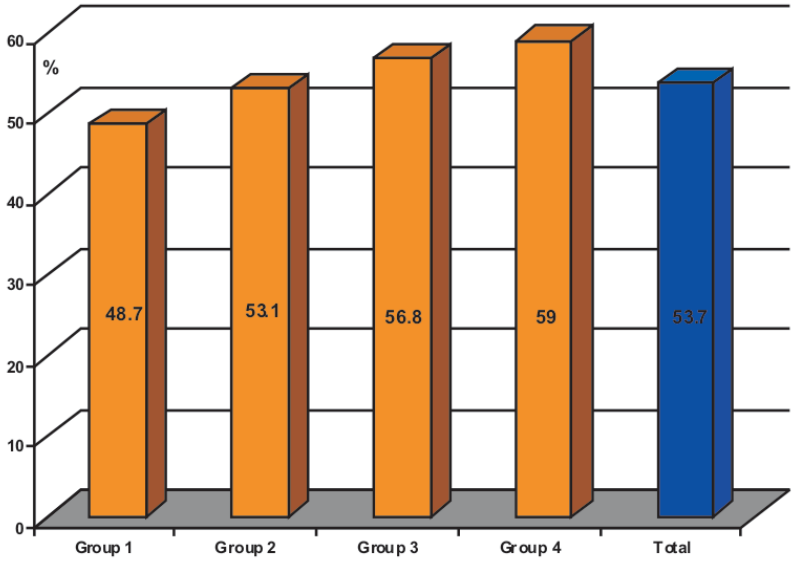

Fig. 6 Prevalence of dyslipidemia

CONCLUSIONS

Type 2 diabetes provokes disorders at the level of glucidic, lipid and proteic metabolism, existing an interrelation between the glucidic metabolic and lipid disequilibrium, shown in the values of the studied parameters.

In the studied samples, over 50% presented disequilibriums of the lipid metabolism, directly related to the glucidic metabolism desequilibrium, expressed by the modifications of HbA1c.

Total cholesterol's values as well as those of triglycerides, were significantly high in the groups suffering of diabetic cardiomyopathy and/or with diabetic kidney disease.

The most important modifications of the studied parameters were observed in the samples pertaining to group 4, explained by the presence of chronic complications, with a direct negative effect over the glucidic and lipid metabolism.

In the present case, the values of HDL cholesterol did not show significant modifications, in comparison to other indicators of the lipid profile (total cholesterol, LDL cholesterol, triglycerides), values that show a clear disturbance, directly related to chronic complications associated with type 2 diabetes.

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