Good Glycemic Control for a Low Cardiovascular Risk in Children Suffering from Diabets

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The study is a prospective and operational one, ant its was conducted on 58 patients with diabetes type 1 and 2. The patients sex distribution was homogenious and they come from both rural and urban environment. The statistical analisys was carried out using the programme SPSS 17.0 for Windows. The distribution normality was cheked using the Kolmogorov - Smirnov Z test. he values of glycemia, glycosylated hemoglobin, lipid panel, blood pressure have been measured and compared to the ones belonging to the control group.

Keywords: cardiovascular risk, diabetes type 1 and 2

Insulin resistance and diabetes are two major risks for cardiovascular diseases; a study carried out over a period of 15 years confirms the fact that diabetes is a more important risk factor than smoking [2,5]. The risk of cardiovascular diseases is up to eight times higher in patients with diabetes than in the case of people not sufferig from it, and cardiovascular diseases represent 75% of the causes of death for a diabetic [3,14,15]. The atherosclerosis process affects to the same extent major arteries and microcirculation. Clinical observations indicate the fact that the risk of congestive heart failure is already high in the long subclinical period of altered glucose tolerance which precedes clinically manifest blood sugarimbalance [4].

Diabetes provides a two times higher risk for a coronary disease, major subtypes of strokes, and death due to vascular causes [6]. It can be noticed that the connection between diabetes and fatal myocardial infarction is three times closer than the connection between diabetes and non-fatal myocardial infarction; there are probably more severe coronary injuries in persons suffering from diabetes than in those not suffering from it, this being a different response of myocard at ischemia [7-9].

Studies confirm the hypothesis that glycemia variations determine microangiopathic modifications that are specific to patients suffering from type 1 or 2 diabetes, and the control of glycemia is essential for preventing their occurrance [1,10,13,17]. Adult patients suffering fromblood sugar imbalance and without obvious macrovascular diseases seem to run the same risk of developping cardiac events as nondiabetics who have already experienced a cardiac event [11]. All these represent important arguments for a precocius identification of dyslipidemia, especially when diabetes sets in in childhood[16].

Experimental part

Materials and methods

The study we have carried out is a prospective and operational one, and it has been conducted on 58 patients (46 patients with type 1 diabetes and 12 patients with type 2 diabetes) hospitalized in the diabetes wing of the Emergency Pediatric Hospital Sf. Ioan from Galati during January 2010 - May 2013[18]. The data have been compared to those pertaining to a control group made up of 84 patients who did not belong to risk groups.

Upon hospitalisation, they manifested clinical signs specific to the illness, and the paraclinical investigations indicated dyslipedemia. These patients come from both rural and urban environment, and the sex distribution was homogenious. The values of glycemia, glycosylated hemoglobin, lipid panel, blood pressure have been measured and compared to the ones belonging to the control group.

The serum screening tests should include total cholesterol (TC), high density lipoprotein- cholesterol (HDL), triglyceride (TG), and calculated low density lipoprotein- cholesterol (LDL) levels, non-high density lipoprotein- cholesterol (non-HDL). LDL is usually calculated using the Friedewald formula (LDL = TC-(HDL+TG/5), but this is not accurate if TG levels are above 400 mg%. A borderline or high result should prompt a repeat test. Classification of reports is based on data obtained from children. *Borderline* and *high* correspond to 75th and 95th percentiles, respectively. The acceptable values for TC, LDL, HDL, TG and non-HDL are <170, <110, ≥40,<150 and<120 mg% respectively. Borderline values for TC, LDL, TG and non-HDL are 170-199, 110-129, 150-499 and120-144mg% respectively, with values higher than these qualifying to be labeled *high*.

The level of glycosylated hemoglobin (Hb)A1c was evaluated in the total blood collected on anticoagulant through the latex agglutination-inhibition test, using the kit hemoglobin A1c (Randox Laboratories Ltd., UK) and the wet chemistry analyzer IMOLA. The minimum limit of detection is 0.25 g/dL. In order to calculate %HbA1c, the formula that is applied is %HbA1c= HbA1c (g/dL)/Hb total (g/dL)x100.

The definition of high blood pressure (BP) in child: the rise of systolic blood pressure (SBP) and diastolic blood pressure (DBP) >95th percentile as concerns age, sex and height at at least three consecutive mesurements through auscultation. High-normal BP: SBP or DBP >90th, <95th percentile. HBP 1st phase: SBP and DBP ranging between 95 th percentile and 99 th percentile ; HBP 2nd phase: SBP and/or DBP over 99 th percentile.

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The statistical analysis was carried out using the programme SPSS 17.0 for Windows. The distribution normality was checked using the Kolmogorov-Smirnov Z test. The homogeneity of the variance was checked with the help of Levene's test. Statistical differences between variables were detected by using the Student'sT-test for independent and dependent variables (comparisons between the two groups, significance $p < 0.05$) and ANOVA (simultaneous comparison of three or more goups, significance $p < 0.05$) for normal distribution of value series and homologous nonparametrical tests for abnormal distribution of values.

Both for the clinical parameters and the biological ones, there have been represented the minimal, maximum and medium values, as well as the inferior and superior quartiles which separate the first and, respectively, the last 25% of the values of series of measurements executed, and the confidenceinterval of means over 95%. The average of the values are expressed as $x \pm SD$ when the variability of the observations over the sample average is described, and $\pm SE$ when comparisons of averages are made and the variability of averages and samples variances are pointed out.

Resultsa and discussions

When comparing variables between the two groups studied, there have been noticed statistically significant differencies for the parameters in the table 1, except HDL-C, BMI, weight and DBP. Glycemia and glycosylated hemoglobin, important parameters which influence the observation of the lipid profile homeostasis, presented modifications.

When applying the Student's T-test for comparing patients' samples that present average values of HbA1c under 7% and over 9%, there have been noticed statistically significant differencies for the majority of lipid parameters except HDL, as it is shown in table 2. This comparison supports the idea that the more important the modifications of the lipid profile are, the less balanced diabetes is. The modifications are smaller (ANOVA test is not positive when analysing, after multiple comparisons, the three groups of patients), but progressive.

High values of glycosylated hemoglobin are seldom met in boys, irrespective of the analysed age group, while the average of these values is higher in girls.

Table 1
MULTIPLE COMPARISONS OF THE VARIABLES AVERAGES TESTED ON THE CONTROL SAMPLE AND THE SAMPLE OF DIABETIC PATIENTS

Parameters	Control	Diabetes
Weight (kg)	38.03±20.8	44.63±20.77
BMI	20.51±5.54	21.15±6.23
Glycemia (mg/dl)	**86.36±12.82***	**286.0±84.20***
VLDL (mg/dl)	**20.20±14.75***	**59.53±95.04***
HDL (mg/dl)	50.99±14.27	44.55±15.87
LDL (mg/dl)	**88.31±45.40***	**118.79±58.01***
Total cholesterol (mg/dl)	**159.98±52.19***	**196.19±43.71***
non-HDL	**108.98±49.18***	**151.63±43.23***
Tryglicerides (mg/dl)	**94.52±54.11***	**306.77±476.81***
SBP (mm Hg)	**105.77±11.27***	**114.03±10.44***
DBP (mm Hg)	63.06±9.88	66.56±10.37

*variables with significantly different averages at multiple comparisons (p<0,05, post-hoc ANOVA, Tuckey test)

Table 2
CHOLESTEROL VALUES, ITS FRACTIONS AND THE TRYGLICERIDE ONES FUNCTION OF THE VALUES OF GLYCOSYLATED HEMOGLOBIN

Parameter	glycosylated hemoglobin(%)					
	<6		7-9		>9	
	Average	STD.	Average	STD.	Average	STD
VLDL (mg/dl)	**31.83***	12.78	36.75	23.36	**89.85***	135.53
HDL (mg/dl)	42.75	14.12	47.55	15.68	43.08	16.99
LDL (mg/dl)	**98.17***	35.66	112.05	44.18	**133.50***	71.86
Total cholesterol	**173.25***	32.03	195.75	50.06	**207.12***	40.29
Tryglicerides (mg/dl)	**178.00***	55.50	188.26	116.43	**452.81***	676.26
non-HDL (mg/dl)	**130.50***	27.78	148.20	45.17	**164.03***	44.58

Table 3
COMPARISON OF BP VALUES BETWEEN CONTROL GROUP AND SAMPLES OF PATIENTS SUFFERING FROM DIABETES

Dependant variable	(I) Diabetes	(J) Diabetes	Average difference (I-J)	Error std.	Sig.
AT mm Hg max.	Control group	Type I	-5.45*	1.97	0.01
		Type II	-16.29*	2.95	0.00
	Type I	Control group	5.45*	1.97	0.01
		Type II	-10.83*	3.16	0.00
	Type II	Control group	16.29*	2.95	0.00
		Type I	10.83*	3.16	0.00
AT (mm Hg) min.	Control group	Type I	-2.84	1.98	0.32
		Type II	-8.14*	2.96	0.01
	Type I	Control group	2.84	1.98	0.32
		Type II	-5.29	3.16	0.22
	Type II	Control group	8.14*	2,96	0.01
		Type I	5.29	3.16	0.22

* significant differences among the averages of values for the groups tested for the threshold α=0.05

It can benoticed that, depending on age group, diabetes is difficult to be controlled between 12 and 18 years old when teenagers' psychical and hormonal modifications perturbate the carbohydrate metabolism. There follows the age group ranging from 1 year old to 6, when the patient hardly accepts the lifestyle specific to diabetes.

Heredocolateral antecedents are important in both types of diabetes; within the sample studied, they had a better representation for patients with type I diabetes (16.28%) in comparison with patients suffering from type II diabetes (6.67%).

Table 3 makes obvious the presence of statistically significant differences ($p<0.05$) from the point the view of average values of SBP between the control group and the group of patients suffering from blood sugar imbalance of type I and II diabetes, but also between the patients suffering from blood sugar imbalance of type I and those suffering from blood sugar imbalance of type II diabetes. From the point of view of the DBP, we have notived significant differences only between the patients suffering fromblood sugar imbalance type 2 diabetes and the control sample.

VLDL is a parameter characterized by a significant increaseof values in patients suffering from diabetes. Within the sample analysed, there have been noticed values of 20.20±14,75 mg/dL in the control group; values of 69.74±10.60 mg/dL in the sample of patients suffering from type 1 diabetes (three times higher values) and of 30.27±12.24 mg/dL in patients suffering from type 2 diabetes. CT also had high values compared to the control group whoch presented an average value of 159.98±52.19. For patients suffering from blood sugar imbalance of type I diabetes, TC had a medium value of 202.21±46.83 mg/dL (high), and for the sample of patients suffering from blood sugar imbalance of type 2 diabetes a medium value of 178.93 (normal-high) ± 27.73 mg/dL.

Within the studied sample, 38% of the patients with diabetes presented a high LDL, the average value being 118.79±58.01 mg/dL, statistically different from the LDL value of the control group, i.e. 88.31±45.40 mg/dL ($p<0.05$).In patients with blood sugar imbalance of type I diabetes, LDL was 123.63±64.15 mg/dL, in those with blood sugar imbalance of type II diabetes LDL was 104.93±32.83 mg/dl. Neatly higher values can be noticed in patients with blood sugar imbalance of type I diabetes.

For non-HDL, there have been noticed significant differences among the control group, for which the average value was 108.98±49.18 mg/dL, compared to 157.51±51 mg/dL for the sample of patients suffering from type I diabetes and, respectively, 134.80±24.66 mg/dL for the sample of patients suffering from type II diabetes. These values are in accordance with the TC values and the values of the other lipid fractions.

HDL presented steady low values within the two lots: 44.70±16.86 mg/dL in patients suffering from type I diabetes and 44.13±13.13 mg/dL in patients suffering from type II diabetes, in comparison with the control group for which the average value was 50.99±14.96 mg/dL.

Generally, tryglicerides have neatly superior values in the case of unbalanced type I diabetes , which has been shown in our study, too: 353.09±54.37 mg/dL. In the case of type II diabetes, the average values of 164.50±59.69 mg/dL were also high in comparison with the control group that presented a value of 94.52±54.11.

As a conclusion, the lipid profile is modified to a larger extent in the case of blood sugar imbalance of type 1 compared to that of type 2; within the groups of subjects analysed, the TG value was high in both groups, the experimental and the control one, while the TC and non-HDL values were high in the group of patients suffering from type I diabetes. Normally high values of non-HDL were noticed in the case of patients suffering from type II diabetes, while the LDL values were high for both groups.There were no low values for HDL in either sample studied.

In Austria (Viena and Graz), it has been carried out a study which concerned the prevalence and degree of cardiovascular risk on a lot of 264 children and teenagers suffering from blood sugar imbalance of type I diabetes. The glycemic control was insufficient in 60.6% of the

patients, the tryglicerides rose to 22.7%, the body mass index is high in 20.1% of the patients. The higher prevalence of the risk factors was correlated with the patient's age, the lapse of time since the beginning of the disease, the level of HbA1c and the necessary amount of insuline. In conclusion, children and teenagers suffering fromblood sugar imbalance of type I diabetes present a higher prevalence of factors of cardiovascular risk compared to the persons not suffering from it. In order to prevent future cardiovascular events, achieving a good glycemic control, early identification of supplementary risk factors and adequate intervention are extremely important [12].

Within the analysed sample of patients suffering from diabetes, from the point of view of glycosylated hemoglobin, 26% had normal values, so a balanced diabetes from the glycemic point of view; for 31% of the patientsthe value of HbA1c ranged between 7-9%, while for 43% of the patients it went beyond 9%. Thus, in comparison with the study conducted in Austria, 74% of the patients had an insufficient glycemic control. From the point of view of the values of glycemia upon hospitalisation, only 29% showed normal values, the rest showing increased values. IMC shows that 76% of the patients suffering from diabetes have normal weight, 24% are overweight and obese.

Conclusions

Within the studied sample, it can be noticed that patients within the 6-12 year-old age group are prevalent, this being the debut age (in continuous decrease), but, for the other age groups, the glycemic equilibrium is difficult to be maintained. It can be noticed the presence of statistically significant differences for all lipid parameters, except HDL cholesterol between the control and the experimental groups. There are statistically significant differeneces ($p<0.05$) from the point of view of the average values of sistolic SBP between patients suffering from blood sugar imabalance of type I diabetes and those suffring from blood sugar imbalance of type II diabetes and between the control group and the experimental one.

The Student's T-test shows statistically significant differences between the sample of patients withHbA1c below 7% and those with values over 9 %, reinforcing the importance of maintaining a good glycemic equilibrium in patients with diabetes; but, simultaneously, it is recommended the monitoring of the lipid profile and the application of therapeutical measures. Comparing the values of tryglicerides, cholesterol and its fractions between the sample of patients with normal values of glycemia and those with hyperglycemia, it can be noticed the fact that significant differences occur in all three parameters.

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