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### *The lipid disorders problem in type 2 diabetes patients*

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Problem zaburzeń lipidowych u pacjentów z cukrzycą typu 2

#### INTRODUCTION

Quantitative and qualitative changes in lipids profile concomitant to type 2 diabetes (DM2) increase the risk of atheromatic complications. Because of that, it is necessary to provide adequate monitoring and effective treatment of these disorders as quickly as possible.

Nowadays lowering of LDL-cholesterol level is a favored aim of treatment but everyone should tend to the normalization of the whole lipid profile: rising of HDL-cholesterol, lowering of LDL-cholesterol and triglycerides plasma concentrations – firstly by the non-pharmaceutical methods and, when it is not satisfactory, with statins, fibrats or other medicines. In case of monotherapy failure, the combined treatment is recommended. But the combination of statins and fibrat is connected with increased risk of liver failure, muscle inflammation and rhabdomyolysis, especially when kidney failure is present. During the lipidemia treatment we cannot disregard accurate glycemia control.

According to the recent Polish Diabetes Association (PTD) guidelines, the desired lipid parameters in diabetic patients are:

- plasma total cholesterol (TC) concentration <4.5 mmol/l (<175 mg/dl)
- plasma cholesterol of high density lipoproteins (HDL) concentration >1.0 mmol/l (>40 mg/dl) in males and >1.3 mmol/l (>50 mg/dl) in females
- plasma triglycerides (TG) concentration <1.7 mmol/l (<150 mg/dl)
- plasma cholesterol of low density lipoproteins (LDL) concentration <2.6 mmol/l (<100 mg/dl) [ $<1.9$  mmol/l (<70 mg/dl) in diabetes patients with diagnosed ischemic heart disease]
- plasma „non-HDL” cholesterol concentration <3.4 mmol/l (<130 mg/dl).

If a patient treated with maximal, well-tolerated statins doses doesn't achieve the desired destination values, the alternative aim could be a 40% reduction of LDL level.

The PTD recommend lipid levels control just after diagnosis of DM2 and minimum once a year later, depending on their concentrations. If the values are increased, the control is recommended once

every 8-12 weeks till the desired levels are achieved. It is permissible to control lipid levels once every two years in patients with DM2 and the low risk of cardio-vascular complications development. (1)

## THE AIM OF THE STUDY

The aim of the study was the assessment of compliance to the PTD guidelines in the area of previous lipid disorders treatment in type 2 diabetic patients hospitalized in the Department of Internal Diseases.

## MATERIAL AND METHODS

There were examined 102 patients below 80 years of age, with DM2 diagnosed at least 2 years earlier, who were treated between 23.03.06 and 22.03.07 at the Department of Internal Diseases of Medical University in Lublin. They were asked about previous diagnostics and treatment of lipid disorders, concomitant diseases and diabetes complications. The knowledge of proper diet and physical activity was assessed according to a self-made algorithm. TC, HDL and TG plasma concentrations were assessed according to the enzymatic method (Konelab 60). LDL plasma concentration was calculated according the Friedewald formula (2). The results were compared in two groups: patients of primary care departments (PCD; n = 64) and patients of diabetological ambulatory (DA; n = 38). The results were analyzed using Statistica for Windows Version 5.5 software. There were used  $\chi^2$  tests for comparison of nonparametric values of the studied groups and U Mann-Whitney test for comparison of parametric values.

## RESULTS

Analyzing the lipid-lowering treatment and actually assessed lipid levels, we found lipid disorders in 91 (96%) patients: (59 of PCD and 28 of DA group). The prevalence of lipid disorders did not differ significantly in the examined groups (PCD: 97% vs. DA: 93%;  $p \approx 0,8$ ). The groups did not differ also in mean TC ( $p \approx 0,5$ ), HDL ( $p \approx 0,8$ ), LDL ( $p \approx 0,9$ ) and TG ( $p \approx 0,2$ ) concentration values.

Thirty six (36; 35%) examined subjects reported that they had assessed TC level on average every 6 months, 27 (26%) – once a year, 22 (22%) – less than once a year, 17 (17%) – they had not performed such an examination. Significantly more frequently ( $p \approx 0,003$ ) TC level had been assessed in DA patients (every 6 months: 55% vs. 23%, once a year: 26% vs. 27%, less than once a year: 11% vs. 28%, no assessment in: 8% vs. 22%).

Twenty four (24; 24%) examined subjects reported that they had assessed lipids fractions on average every 6 months, 27 (26%) – once a year, 18 (18%) – less than once per year, 33 (55%) – they hadn't performed such an examination. Significantly more frequently ( $p \approx 0,03$ ) lipids fractions had been assessed in DA patients (every 6 months: 39% vs. 14%, once a year: 24% vs. 28%, less than once a year: 16% vs. 19%, no assessment in: 39% vs. 21%).

Lipid-lowering drugs (statins or fibrates; there were no cases of combined treatment) were taken by 29 (29%) of the subjects; 71 (71%) didn't take them, including 4 (4%) due to contraindications or bad tolerance. Two (2) of the examined patients didn't know the type of treatment they had. They were excluded from the analysis. When comparing the groups, we did not take into account subjects

with contraindications, either. Among the 83 subjects with lipid disorders, without contraindications to lipid lowering treatment, 26 patients (31%) received statins or fibrates. The DA subjects received these drugs more often: in the entire group: 42% vs. 23% ( $p$  0.06), among subjects with lipid disorders: 44% vs. 25% ( $p$  0.08). In both groups we found widespread ignorance of the principles of lifestyle modification recommended in lipid disorders.

Significant discrepancy between the achieved results and targets recommended by PTD for lipid lowering treatment was found in both examined groups. The details are presented in Figure 6.

Table 1. Total cholesterol plasma concentrations of examined subjects (mg/dl)

	n	Mean	SD	Median	Minimum	Maximum	Lower Quartile	Upper Quartile
<b>PCD</b>	64	211.84	69.24	200	104	459	165	243.5
<b>DA</b>	34	193.09	38.22	196.5	112	254	165	227
<b>ALL</b>	98	205.34	60.75	198.5	104	459	165	231

Table 2. HDL cholesterol plasma concentrations of examined subjects (mg/dl)

	n	Mean	SD	Median	Minimum	Maximum	Lower Quartile	Upper Quartile
<b>PCD</b>	61	45.93	13.04	44	22	91	37	52
<b>DA</b>	30	46.63	12.75	44	28	76	37	54
<b>ALL</b>	91	46.16	12.88	44	22	91	37	54

Table 3. LDL cholesterol plasma concentrations of examined subjects (mg/dl)

	n	Mean	SD	Median	Minimum	Maximum	Lower Quartile	Upper Quartile
<b>PCD</b>	61	125.72	49.3	116	43	270	93	155
<b>DA</b>	29	120	36.48	128	42	177	93	145
<b>ALL</b>	90	123.88	45.44	118	42	270	93	154

Table 4. Triglycerides plasma concentrations of examined subjects (mg/dl)

	n	Mean	SD	Median	Minimum	Maximum	Lower Quartile	Upper Quartile
<b>PCD</b>	62	211.5	311	144.5	67	2441	109	197
<b>DA</b>	31	138.52	56.7	131	44	251	99	173
<b>ALL</b>	93	187.17	257.6	133	44	2441	109	194

Figure 1. Frequency of plasma total cholesterol concentration assessment in examined group.

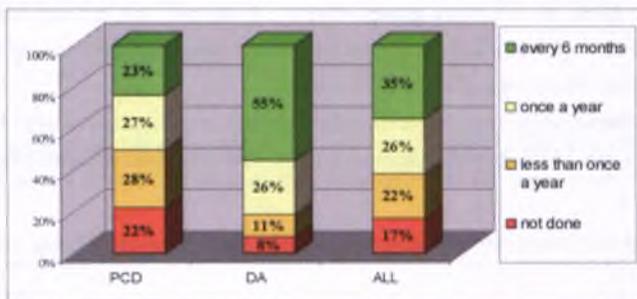


Figure 2. Frequency of lipids profile assessment in examined group.

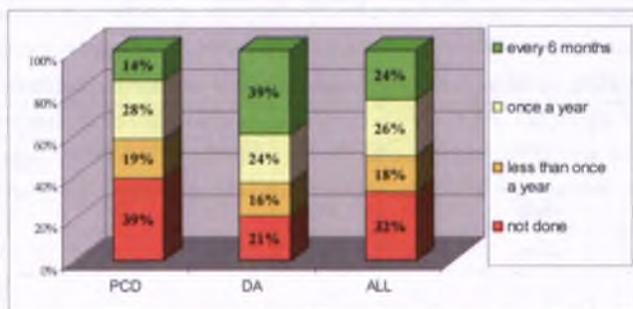


Figure 3. The knowledge of principles of dietary treatment recommended in lipid disorders in examined patients with DM2.

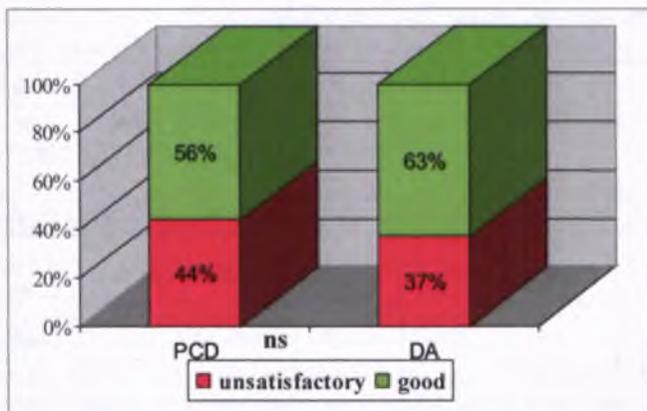


Figure 4. The knowledge of principles of proper physical activity in examined patients with DM2.

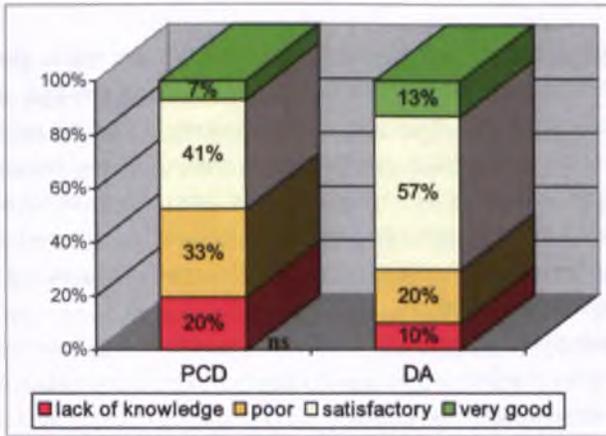


Figure 5. Lipid lowering treatment before admission to the clinic.

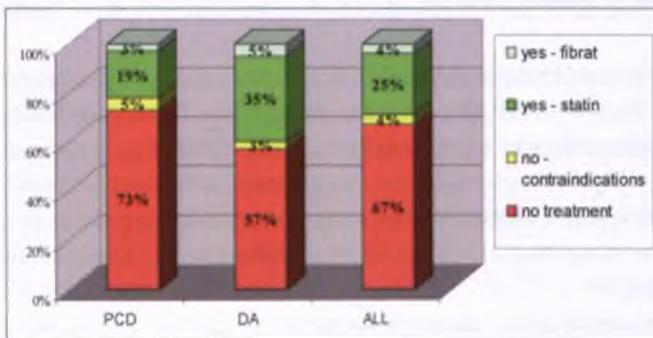
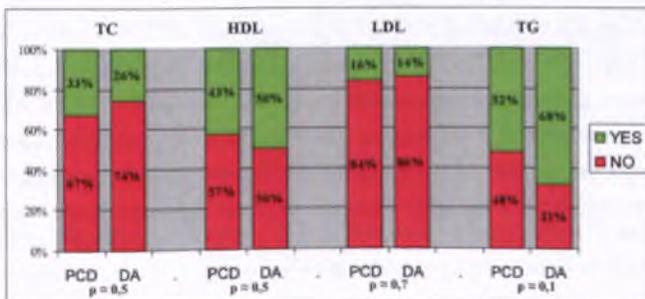


Figure 6. Compatibility of plasma lipids concentrations in examined subjects with DM2 and targets recommended by Polish Diabetes Association.



## DISCUSSION

According to the guidelines of Polish Diabetes Association, the results of our study are not satisfactory. The prevalence of lipid disorders in patients with DM2 is very high, their diagnosis and treatment are often neglected and their results differ significantly from the recommended targets. Similar irregularities were observed in previous Polish studies, but also elsewhere in the world. However, it should be noted that after implementation of the guidelines of scientific societies, the educational and clinical programs in this field seem to be systematically improving (3, 4).

In 1995 Jałocha found that 13% of patients with DM2 diagnosed by him, had never had plasma cholesterol concentration assessment (5).

In the Czech study lipid profile was assessed in 45% of patients with diabetes treated in primary health care, 45% treated in county diabetological outpatient departments and in 79% of voivodship diabetological outpatient departments; adherence to recommended targets in lipid administration was found in 14.8% of the examined subjects (6).

Similarly to our study, in the study by Jaworska, (7) lipids disorders diagnostics was performed significantly more frequently in diabetes outpatient departments. In Jaworska's study, 76% patients with DM2 treated in diabetes outpatient departments had cholesterol level checked at least once a year.

It is common and well documented (6, 7, 8) that performing of tests recommended by scientific societies is more frequent in patients under specialist care. The QuED study shows more frequent HbA1c, HDL-cholesterol, mikroalbuminuria tests and ophthalmologic examinations in patients treated in diabetes outpatient departments. On the other hand, in the same study it was demonstrated that more frequent testing itself, really does not translate into better therapeutic effects (9). It is not surprising because, as our study shows, they were not sufficiently mobilised to lifestyle changes and not properly treated.

The quality of care on type 2 diabetes patients in French primary health care was assessed twice in DIABEST study (Diabetes Education Surveillance & Treatment Assessment). In 1997 there were significant deficits found – less than a half of practices realized the guidelines at least in 80%. The total cholesterol test during past 12 months was performed by 77% of patients with DM2 treated in primary care. The plasma triglycerides concentration assessment was made to 75% of patients. A year later, after introduction of an educational program for family doctors and individual presentation of their errors, the percentage of patients, who in the past year had performed these tests, was assessed at: 84% and 83% respectively. In 1997 plasma total cholesterol concentration below 250 mg/dl was found in 84% of cases, and triglycerides concentration below 190 mg/dl - in 77%. After introduction of the program the percentage of these patients was assessed at 85% and 78% respectively (4). That study shows how much can be achieved by appropriate proceedings. Our study shows that first of all Polish physicians should be convinced about better education and more aggressive lipid lowering treatment in patients with DM2.

## CONCLUSION

- Implementing of the PTD guidelines for monitoring and treatment of lipid disorders in patients with type 2 diabetes is far from ideal.
- Family doctors conduct diagnostics and pharmacological treatment of lipid disorders in patients with type 2 diabetes less intensively than diabetologists.
- The frequency of the use of lipid lowering drugs increases with the severity of coronary heart disease, but it seems to be unsatisfactory in all of the groups.
- The percentage of patients with type 2 diabetes having the desired concentrations of plasma lipid fractions is small, particularly in relation to total cholesterol and LDL cholesterol, what may indicate inadequate treatment on one hand, but which may also indicate too rigorist guidelines, which are too difficult to achieve on the other hand.

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## SUMMARY

Lipid metabolism disorders concomitant to type 2 diabetes mellitus (DM2) increase the risk of atherosclerosis complications, therefore the proper monitoring and treatment of them is necessary.

THE AIM of the study was to assess the realisation of Polish Diabetes Association (PTD) guidelines concerning dyslipidemia treatment in DM2 patients.

**MATERIAL AND METHODS:** We examined 102 patients with DM2 admitted to Internal Diseases Clinic. The review concerning previous education, diagnostics and treatment of lipid disorders was performed. The plasma total cholesterol (TC), HDL and triglycerides concentrations were estimated according to the enzymatic method. LDL cholesterol was calculated by Friedewald formula.

**RESULTS:** Sixty four (64) examined subjects had been previously treated only in primary care departments (PCD), 38 had been patients in diabetological ambulatory (DA). The prevalence of dyslipidemia was assessed at about 96% in both groups. We found common lack of knowledge and negligence of life style changes appropriate for lipid disorders in both groups. The reported frequency of lipid profile examination was significantly different from the one recommended by PTD. Plasma lipid concentrations were assessed more often in DA subjects. Nineteen percent (19%) of PCD subjects and 35% of DA group were treated by statins, 3% and 5% by fibrat respectively. We found TC <175 mg/dl in 33% of PCD subjects and in 26% of DA. We found the recommended HDL cholesterol level in 43% and 50%, LDL cholesterol in 16% and 24%, triglycerides in 52% and 68% of subjects respectively.

**CONCLUSIONS:** Monitoring and treatment of lipid metabolism disorders in examined type 2 diabetes patients were not satisfactory.

**Key words:** type 2 diabetes, lipid metabolism disorders, primary care, diabetological ambulatory

## STRESZCZENIE

Ponieważ zaburzenia lipidowe towarzyszące cukrzycy typu 2 (DM2) zwiększają ryzyko powikłań miażdżycowych, konieczne jest ich właściwe monitorowanie i leczenie.

**CELEM PRACY** była ocena realizacji zaleceń Polskiego Towarzystwa Diabetologicznego (PTD) w zakresie zwalczania dyslipidemii u pacjentów z DM2.

**MATERIAL I METODY:** Zbadano 102 osoby z DM2 rozpoznaną co najmniej 2 lata wcześniej, którzy zostali przyjęci do Kliniki Chorób Wewnętrznych. Zebrano wywiad odnośnie wcześniejszej edukacji, diagnostyki i leczenia zaburzeń lipidowych. Stężenie cholesterolu całkowitego (TC), HDL i triglicerydów oznaczono metodą enzymatyczną. LDL wyliczono według wzoru Friedewalda.

**WYNIKI:** Wśród badanych 64 było wyłącznie pod opieką poradni lekarza rodzinnego (PI.R), a 38 było pacjentami poradni diabetologicznych (PD). W obu grupach rozpowszechnienie dyslipidemii oszacowano na około 96%. Zarówno wśród badanych z PI.R jak i z wśród badanych z PD stwierdzono powszechny brak znajomości i zaniedbywanie zmian w stylu życia zalecanych w zaburzeniach lipidowych. Zgłaszana częstość badania profilu lipidowego istotnie odbiegała od zalecanej przez PTD. Istotnie częściej oznaczane stężenie lipidów w osoczu mieli badani z PD. 19% pacjentów PI.R i 35% PD przyjmowało statynę, odpowiednio: 3% i 5% – fibrat. TC <175 mg/dl stwierdzono u 33% badanych z PI.R i 26% z PD. Odpowiednio zalecane stężenie cholesterolu HDL stwierdzono u 43% i 50%, a LDL u 16% i 24% badanych. Triglicerydemię <150 mg/dl stwierdzono u 52% pacjentów PI.R i 68% PD.

**WNIOSKI:** Monitorowanie i leczenie dyslipidemii u zbadanych pacjentów z DM2 było niezadowolające.

**Słowa kluczowe:** cukrzyca typu 2, zaburzenia lipidowe, podstawowa opieka zdrowotna, poradnia diabetologiczna