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Diabetes of type 1 and 2 as the reason for hospitalization in the Department of Internal Medicine in the year 2004

Prevalence of diabetes grows up in the last years, and prognoses referring to this process are very bad. The degree of diabetes control determines the presence of diabetic angiopathy (11, 12, 13, 14).

The aim of the work was the estimation of the degree of levelling of disturbances of the carbohydrate metabolism in patients with diabetes of type 1 and 2 hospitalized in the Clinic of Internal Medicine in the year 2004 and the determination of prevalence of long--lasting complications – micro-, macroangiopathy and diabetic polyneuropathy.

MATERIAL AND METHODS

We specified and analysed diseases coexisting with diabetes on the basis on international classification of diseases (10). For estimations of the state of control diabetes of type 1 (DM1) and 2 (DM2) there were used marks of glycosylated hemoglobin (HbA1C), which were done in Hospital Laboratory within diagnostics during hospitalization. Glycosylated hemoglobin was measured by the immunoturbinometric method, during measurement HbA1C with antibodies was determined.

The examined groups were compared using computer programme Statistica 6.15. We also used T-Student test, Avon test, *post hoc* test; statistically significant differences were expressed by giving P value, statistically significant values $P<0.05$.

In the Department of Internal Medicine in 2004 there were hospitalized 423 diabetic patients, 227 women (53.66%) and 196 (46.34%) men. There were 79 (18.7%) type 1 diabetic patients, and 348 (82.3%) type 2 diabetic patients. From among the hospitalized 17 (4.0%) patients died.

RESULTS

Among all patients with diabetes aged up to 49 years there were hospitalized 56 persons (13.24%), aged 50–59 years – 68 persons (16.08%), aged 60–69 years – 95 patients (22.46%), aged 70–79 years – 36 patients (32.15%), over 80 – 68 patients (16.08%). Average age of patients with diabetes of type 2 was about about 15 years older in comparison with age of patients with type 1 diabetes. Figure 1 shows diseases coexisting with diabetes of type 1 and 2 in patients hospitalized in the Department of Internal Medicine in 2004.

Endocrinopathy and metabolic disorders as hospitalization reasons of diabetes type 2 occurred in 52 patients (14.95%), a great part were lipid disorders and obesity 40 (11.5%), we did not observe diseases of thyroid. In diabetes of type 1 hypothyroidism occurred in 3 (3.8%) patients, and remaining endocrine diseases in patients 8 (10.13%).

Diseases of the alimentary canal in diabetes of type 2 were found in 6 (1.72%) patients. Those were mostly gallstones (0.86%), and in diabetes of type 1 – disorders of motor function of the large intestine in 3 (3.8%) hospitalized patients. Diseases of the respiratory system accompanied

diabetes of type 2 in 6 patients (1.72%), mostly chronic pulmonary obstructive disease. Disorders of carbohydrate metabolism were assessed on the basis of the level HbA1C. In all patients with diabetes average concentration of HbA1C was 8.8%.

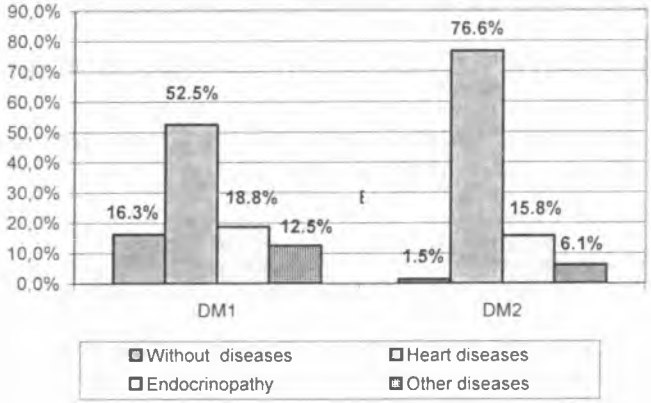

Fig. 1. Diseases coexisting with diabetes of type 1 (DM1) and 2 (DM2) in patients hospitalized in the Department of Internal Medicine in 2004

In diabetes of type 1 HbA1C were marked in 57 (72%) patients and average value was 9.91+/–2.38%, and in diabetes of type 2 in 190 (55%) patients the average value was 8.50%+/–2.13%. Differences between averages were statistically significant. P<0.05.

Patients aged up to 49 years had the average HbA1C concentration 9.65+/–2.49%, aged 50–59 years 9.20%+/–2.57%, aged 60–69 years 8.89+/–2.14%, in ages 70 years and over 8.23+/–1.93%. The Anova test and the *post hoc* permit to ascertain that HbA1C in older people is lower than in younger ones. We did not find statistically significant differences between average values of the glycosylated haemoglobin in hospitalized women (HbA1C – 8.68%) and men (HbA1C – 8.98%). The level of glycosylated haemoglobin in diabetics in groups according to coexisting diseases is shown in Table 1.

Table 1. Level of glycosylated haemoglobin in patients with diabetes according to coexisting diseases

Diseases coexisting with diabetes	Average value Hb A1C (%)	Standard deviation
Cardiovascular system diseases	8.55%	+/–2.08
Endocrinic diseases other than diabetes	9.03%	+/–2.26
Other diseases	9.68%	+/–2.74
Without concurrent diseases	10.71%	+/–2.93

The Anova test showed statistically significant differences between groups of patients with diseases coexisting with diabetes (P<0.05). The *post hoc* test (Tukey HSD) showed statistically significant differences in the level of haemoglobin HbA1C only in the group with diseases of the circulation system and without coexisting diseases, the higher level was in the group without coexisting diseases. Additionally, we have done the test of fitting of variable schedule HbA1C in

the analysed groups to the normal schedule, with regard to the low number of patients in the group without diseases concurrent with other diseases.

DISCUSSION

In the examined population we found lower average HbA1C values in diabetes of type 2 compared to diabetes of type 1. Graber et al. (5) did not observe, however, similar differences in the levelling of diabetes in hospitalized patients with diabetes of type 1 and 2. Perhaps the number of patients in the groups had an influence on differences in findings.

In the examined population correct control of diabetes was assessed on the basis on HbA1C. HbA1C up to 6.1 had only 19 (7.7%) hospitalized patients, HbA1C 6.2 (8%) was in 86 (34.8%) patients, and over 8% in 142 (57.5%), in this the level of HbA1C above 9% was found in 142 patients (39.3%). The level of HbA1C in the blood serum acknowledged as satisfying (below 7% value) appeared in 50 (20.20%) patients.

High values of HbA1C (8.8%) deviating from the recommended ones were observed in the hospitalized by other authors (the Grabber HbA1C average – 9.1%, Deckers – HbA1C – 8.5%), which results from the severity of patients' state and presence of indications for hospitalization connected with diabetes and coexisting diseases (3, 5, 15). Data of ambulatory patients were quoted by different authors and it was showed that diabetes was better assessed on the basis of marks HbA1C. In the research of Charpentier (2) in diabetes of type 2 average values were HbA1C 7.6+/–1.6%, similarly in Farnkvist's (4) HbA1C average values were 7.3+/–1.3%. Charpentier (2) also described higher comparatively to our percentages of patients (27%), the level of HbA1C up to 6.5%. The level of HbA1C above 8% had 34% of the investigated persons, while in our research this was the half of the treated. It is possible to explain this by the fact that the research of Charpentier's included patients with diabetes of type 2 without hospitalization.

According to Tseng et al. (15) the prevalence of the high level of HbA1C (HbA1C above 9% in 17.3–5.3%) patients depends on the season and climate, but first of all, on diet.

For many years among doctors there was held the conviction that the diabetes was the main factor of the risk of atherosclerosis, however, the introduction of the definition of cardiodiabetology by the decision of the American Heart Association caused that diabetes was acknowledged an equivalent of the heart disease creating a huge scale of problems.

In our population the prevalence of cardiovascular diseases in patients with diabetes was large and similar to that observed by other authors (1, 6, 8, 9, 12). Comparison of frequencies of occurrence of diseases coexisting with diabetes of type 1 and 2 showed statistically significant more frequent occurrence of diabetes of type 2 ($P<0.05$). This referred mostly to diseases of the cardiovascular system ($P<0.05$).

In patients with diabetes of type 1, among diseases of the cardiovascular system most often occurred hypertension and it concerned 30.38% (24 patients), acute and chronic coronary heart disease occurred in 10.12% (8) patients, disorders of heart rhythm in 2.53% (2). In patients with diabetes of type 2 among cardiovascular system diseases most often occurred hypertension – 52.30% (182) patients, coronary heart disease – 9.20% (32), disorders of heart rhythm – 2.59% (9), cardiomyopathy and valve defects – 2.6% (9), heart failure in 8.91% (31). In diabetics with type 2 we observed a higher percentage of patients with heart failure – 8.91% (31) of persons from among hospitalized patients in comparison with diabetics with type 1 – 2.53% (1) of all hospitalized persons. Farnkvist et al. (4) observed almost identical prevalence of hypertension in diabetics with type 2 (50% ill), instead, coronary heart disease (26%) and heart failure (29%) occurred more often than in our patients.

Authors assent to the idea of participation of metabolic changes in the formation of diabetic changes of micro- and macroangiopathy type (1, 9). Grimaldi et al. (6) think that the high level of HbA1C (about 1%) increases coronary risk by about 10%, similar are opinions of other authors. So the degree of control of diabetes correlates with the presence of diabetic angiopathy (7).

In our research, the values of HbA1C in patients with diabetes without associate diseases as compared with a group with diseases of the cardiovascular system were indeed statistically higher in the examined population, though it is possible to expect the inverse situation in the light of reports about the parallelism of vascular changes with the levelling of diabetes.

More frequent occurrence of diseases of the cardiovascular system concerns the examined population of people with diabetes of type 2 (statistically significant differences in the level of HbA1C can be explained by more advanced age of patients with diabetes of type 2 – patients with diabetes of type 2 are by 15 years older than people with diabetes of type 1).

CONCLUSIONS

1. Among patients hospitalized with diabetes, the diseases of the cardiovascular system are general; more often they refer to patients with diabetes of type 2 than of type 1.

2. Patients hospitalized with diabetes of type 1 have a worse control of metabolic disturbances than those with diabetes of type 2, which was ascertained on the basis of HbA1C assays.

REFERENCES

1. Asami M. et al.: The frequencies of diabetic complications in elderly non-insulin dependent diabetic patients in Himeji. Diabetes Res. Clin. Pract., 34 Suppl., S79, 1996.
2. Charpentier G. et al.: ESPOIR Diabetes Study Investigators. Control of diabetes and cardiovascular risk factors in patients with type 2 diabetes: a nationwide French survey. Diabetes Metab., 29, 152, 2003.
3. Deckers S. et al.: Therapy, glycaemic control and complications in type 1 diabetic patients: results from a single centre cohort of 465 subjects. Acta Clin. Belg., 56, 289, 2001.
4. Farnkvist L.M., Lundman B.M.: Outcomes of diabetes care: a population-based study. Int. J. Qual. Health Care, 15, 301, 2003.
5. Graber A. et al.: Clinical characteristics of hospitalized diabetic patients: South Med. J., 79, 281, 1986.
6. Grimaldi A., Heurtier A.: Epidemiology of cardiovascular complications of diabetes. Diabetes Metab., 25, 12, 1999.
7. Haffner S.J., Cassells H.: Hyperglycemia as a cardiovascular risk factor. Am. J. Med., 115, 6S, 2003.
8. Kozek E. et al.: Chronic complications and risk factors in patients with type 1 diabetes mellitus – retrospective analysis. Przegl. Lek., 60, 773, 2003.
9. Lewis S. et al.: Predicting vascular risk in type 1 diabetes: stratification in a hospital based population in Scotland. Diabet. Med., 22, 164, 2005.
10. Międzynarodowa Statystyczna Klasyfikacja Chorób i Problemów Zdrowotnych. Rewizja dziesiąta. Tom 1. ICD-10. Uniw. Wyd. Med. VESALIUS, Kraków 1994.
11. Piechota G. et al.: Type-2 diabetes mellitus as a cause of disability. Przegl. Epidemiol., 58, 677, 2004.
12. Roszkowska H. et al.: Cukrzyca jako przyczyna hospitalizacji w Polsce w latach 1980–1999. Przegl. Epidemiol., 56, 633, 2002.
13. Shera A. et al.: Prevalence of chronic complications and associated factors in type 2 diabetes. J. Pak. Med. Assoc., 54, 54, 2004.
14. Takaishi H. et al.: Impact of increasing diabetes on coronary artery disease in the past decade. J. Atheroscler. Thromb., 11, 271, 2004.
15. Tseng C. et al.: Seasonal patterns in monthly hemoglobin A1c values. Am. J. Epidemiol., 161, 565, 2005.

SUMMARY

In the Clinic of Internal Medicine in 2004, 423 patients were admitted because of diabetes. There were 227 women (53.66%) and 196 men (46.34%). Among diabetic patients 56 hospitalized people were up to 49 years of age (13.24%), aged 50–59 years were 68 patients (16.08%), aged 60–69 years were 95 patients (22.46%), aged 70–79 years were 136 patients (32.15%), above 80 years of age – 68 patients (16.08%). There were 79 hospitalized patients (18.7%) with insulin dependent diabetes and 348 patients (82.3%) with type 2 diabetes. The comparison of the frequency of occurring of the diseases coexisting with diabetes of type 1 and 2 showed statistically significant differences and proved the more frequent coexistence of diseases concerning mainly diseases of the cardiovascular system in diabetes of type 2 (DM 1 – 52.5%, DM 2 – 76.6%) (P<0.05). In patients with diabetes of type 1 most often occurred arterial hypertension and it referred to 24 (30.38%) patients, coronary heart disease (8 – 10.12%), dysrhythmia of the heart (2 – 2.53%), heart failure (2 – 2.53%). In patients with diabetes of type 2 arterial hypertension referred to a still higher percentage of patients (182 – 52.30%), coronary heart diseases (32 – 9.20%), dysrhythmia of the heart (9 – 2.59%), heart failure (31 – 8.91%). Patients at the age of up to 49 years had the average concentration of the glycosylated hemoglobin 9.65+/–2.49, aged 50–59 years 9.20+/–2.57, aged 60–69 years 8.89+/–2.14, for ages 70 years and more 8.23+/–1.93. Differences were statistically significant for the oldest and the youngest age group (p<0.05). In people with diabetes of type 1 the glycosylated hemoglobin was assessed in 57 (72%) patients and the average was 9.91+/–2.38, and in people with diabetes of type 2 in 190 (55%) patients and the average was 8.50+/–2.13. The difference was statistically significant P<0.05. In hospitalized people with diabetes the level of HbA1C was significantly statistically higher in the group without accompanying diseases (HbA1C – 10.71%) than in the group with coexisting cardiovascular diseases (HbA1C – 8.55%), P<0.05. It is possible to explain this due to differences in the number of patients in the compared groups, the occurrence of cardiovascular diseases not so much connected with diabetes, as with the age of patients, and also more frequent medical visits of diabetic patients with coexisting cardiovascular diseases. Conclusions: Among the hospitalized with diabetes the diseases of the cardiovascular system are general, more often refer to patients with diabetes of type 2 than of type 1. Patients hospitalized with diabetes of type 1 have a worse levelling of metabolic disturbances than those with diabetes of type 2, which was ascertained on the basis of HbA1C assays.

Cukrzyca typu 1 i 2 jako przyczyna hospitalizacji w Klinice Chorób Wewnętrznych

W Klinice Chorób Wewnętrznych w r. 2004 było hospitalizowanych z powodu cukrzycy 423 pacjentów, w tym było 227 kobiet (53,66%) i 196 (46,34%) mężczyzn. W wieku do 49 lat było 56 osób (13,24%), w wieku 50–59 lat 68 osób (16,08%), w wieku 60–69 lat 95 chorych (22,46%), w wieku 70–79 lat 136 chorych (32,15%), powyżej 80 lat 68 pacjentów (16,08%). Z cukrzycą insulinozależną (DM1) było 79 (18,7%%) chorych, natomiast z cukrzycą typu 2 (DM2) 348 chorych (82,3%). Porównanie częstości występowania chorób współistniejących w cukrzycy typu 1 i 2 wykazało istotne statystycznie różnice i wskazywało na częstsze współistnienie w cukrzycy typu 2 chorób dotyczących głównie układu sercowo-naczyniowego (DM 1–52,5%, DM 2–76,6%) (P<0,05). U pacjentów z cukrzycą typu 1 najczęściej występowało nadciśnienie tętnicze i dotyczyło 24 (30,38%) pacjentów, następnie choroba wieńcowa – 8 (10,12%), zaburzenia rytmu serca – 2 (2,53%), niewydolność serca – 2 (2,53%). U pacjentów z cukrzycą typu 2 nadciśnienie tętnicze dotyczyło jeszcze większego odsetka chorych, tj. 182 (52,30%) pacjentów, choroba wieńcowa – 32 (9,20%), zaburzenia rytmu serca – 9 (2,59%), niewydolność serca – 31 (8,91%). W wieku do 49 lat średnie stężenie hemoglobiny glikowanej wynosiło 9,65+/–2,49, w wieku 50–59 lat 9,20+/–2,57, w wieku 60–69 lat 8,89 +/–2,14, w wieku 70 lat i powyżej 8,23+/–1,93. Różnice były istotne statystycznie dla najstarszej i najmłodszej grupy wiekowej (p<0,05). W cukrzycy typu 1 hemoglobinę glikowaną oznaczono u 57 (72%) chorych i średnia wynosiła

9,91+/–2,38, a w cukrzycy typu 2 u 190 (55%) chorych i średnia wynosiła 8,50+/–2,13. Różnica była statystycznie istotna. P<0,05. U hospitalizowanych z cukrzycą poziom HbA1C był istotnie statystycznie wyższy w grupie bez chorób towarzyszących (HbA1C – 10,71%) w porównaniu z grupą z współistniejącymi chorobami układu sercowo-naczyniowego (HbA1C – 8,55%), p<0,05. Można to tłumaczyć różnicami w liczebności porównywanych grup, występowaniem chorób układu sercowo-naczyniowego nie tyle związanych z samą cukrzycą, co z wiekiem, a także częstszymi wizytami lekarskimi pacjentów przy współistnieniu chorób układu sercowo-naczyniowego z cukrzycą. Wnioski: Wśród hospitalizowanych z cukrzycą choroby układu sercowo-naczyniowego były rozpowszechnione, częściej dotyczyły pacjentów typu 2 niż 1. Pacjenci hospitalizowani z cukrzycą typu 1 mieli gorszą kontrolę zaburzeń metabolicznych niż w cukrzycy typu 2, ocenianą na podstawie poziomu HbA1C.