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Type 2 diabetes in patients older than 70 years — aspects of metabolic control

ABSTRACT

Background. The differences in the clinical manifestation and course of diabetes observed in older individuals should translate into various options of treatment and management of the elderly diabetic patients. Of particular importance is the early detection of disease complications due to its impact on the physical and mental health of elderly patients.

Material and methods. All participants were hospitalised in the Department of Internal Medicine, University Hospital No. 1 between the year 2012–2016. Based on the medical records, the consecutively presenting patients diagnosed with type 2 diabetes were divided into three basic groups: group 1 aged 37–58 years (30 individuals), group 2 aged 70–79 years (30 individuals) and group 3 aged $\geq$ 80 years (50 individuals). The exclusion criteria were lack of logical verbal contact and substantial impairment of physical activity verified with the Katz Basic Activities of Daily Living (ADL) scale. Based on the medical history and documentation, the duration of diabetes, the BMI and frequency of hypoglycaemia were established. Among patients, as part of their stay and regardless of the study conducted, the main parameters were determined referring to metabolic control of type 2 diabetes mellitus (percentage of glycated haemoglobin, lipid profile) and blood pressure measurement.

Results. The particular groups of patients differed in terms of the mean disease duration (p < 0.001),

i.e. 5 ± 6.4 years in group 1, 16.1 ± 8.6 years in group 2 and 14.6 ± 9 years in group 3. There were statistically significant inter-group differences in mean body weight (BW) and BMI (patients $\geq$ 80: BW — 70.7 ± 14.3 (kg), BMI: 27.5 ± 4.3 (kg/m^2); 70–79 years of age group: BW: 77.1 ± 16.4 (kg), BMI: 28.9 ± 6 (kg/m^2); group 1 (BW: 92.4 ± 21.4 (kg), BMI: 31.5 ± 7.0 (kg/m^2). The best glucose control was observed amongst patients $\geq$ 80 (group 3), as compared to group 1 — 47 patients (84%) *vs.* 4 patients (13.3%) (p < 0.001). The percentages of HbA$_{1c}$ were as follows: 8.7 ± 2.3 (%) in group 1, 7.3 ± 1.2 (%) in group 2 and 6.9 ± 0.9 in group 3, respectively (p < 0.001). There were no statistically significant differences in the blood pressure between particular groups of patients. Hypoglycaemia did not occur more frequently in any of the studied groups.

Conclusions. Elderly patients suffering from type 2 diabetes vary in numerous aspects from younger patients. The basic differences were observed in relation to anthropometric indices and average duration of the disease. Treatment of type 2 diabetes in elderly patients leads to excessive control with respect to the carbohydrate metabolism although patients do not report hypoglycaemia more frequently. (Clin Diabetol 2018; 7, 2: 97–101)

Key words: type 2 diabetes, metabolic control, hypoglycaemia

Introduction

As a consequence of polish population ageing and medical advancements in therapy and diagnostics, type 2 diabetes in elderly patients has become a significant health issue. Many complications of long term diabetes are the cause of disability and a considerable decrease in quality of life among these patients. According to numerous studies, the incidence of diabetes increases

Table 1. Anthropometric characteristics of the participants of the study

Variable	Group 1 (37–58 years) n = 30 Mean ± SD	Group 2 (70–79 years) n = 50 Mean ± SD	Group 3 (≥ 80 years) n = 50 Mean ± SD	p
Body mass [kg]	92.4 ± 21.4	77.1 ± 16.4	70.7 ± 14.3	< 0.001
height [m]	1.7 ± 0.1	1.6 ± 0.1	1.6 ± 0.1	< 0.001
BMI [kg/m^2]	31.5 ± 7	28.9 ± 6	27.5 ± 4.3	0.011
Mean disease duration (years)	5 ± 6.4	16.1 ± 8.6	14.6 ± 9	< 0.001

SD — standard deviation

with age, reaching 25–30% in populations over the age of 65 [1, 2]. Impaired fasting glycaemia (IFG) and impaired glucose tolerance (IGT) are important risk factors of type 2 diabetes and may increase the risk of its occurrence by 10 to 20 times, regardless of age [3]. In one of the studies, an increase in incidence of carbohydrate metabolic disorders in the form of impaired glucose tolerance was observed — from 11.1% in individuals aged 40 to 49, to 20.9% in those aged from 60 to 74 [4]. In elderly patients, concomitant diseases may lead to difficulties in correct interpretation of signs and symptoms, making diabetes very hard to identify.

The problem with type 2 diabetes in elderly patients lies not only in difficulties with diagnosis and treatment. It is also challenging to maintain proper glycaemic and lipid control as well as correct blood pressure values. Insufficient metabolic correction is connected with early occurrence of complications that may lead to disability. At the same time, excessive anti-diabetic treatment may be the cause of hypoglycaemic episodes that decrease quality of life and may promote cardiovascular incidents such as dangerous arrhythmias or acute coronary syndromes, especially in geriatric patients.

Material and methods

All participants were hospitalised in the Department of Internal Medicine, University Hospital No. 1 between 2012–2016. Based on medical records, the consecutively presenting patients diagnosed with type 2 diabetes were divided into three basic groups:
— group 1 aged 37–58 years;
— group 2 aged 70–79 years;
— group 3 aged ≥ 80 years.

130 type 2 diabetes patients with known disease duration, body mass and height, were included into the study. Group 1 consisted of 30 patients aged under 60, while groups 2 (aged from 70 to 79) and 3 (aged ≥ 80) consisted of 50 patients. Based on medical history and documentation, the duration of diabetes, BMI and frequency of hypoglycaemia in the year prior to the

study were established in each respective group. Among patients, as part of their stay and regardless of the study conducted, the main parameters were determined referring to metabolic control of type 2 diabetes mellitus (percentage of glycated haemoglobin, lipid profile) and blood pressure measurement. The results were assessed in accordance with metabolic control criteria of type 2 diabetes recommended by the Polish Diabetes Association.

Patients excluded from the study either did not meet the age criteria or were unable to maintain logical, verbal contact, making it impossible to collect thorough history of metabolic control and diabetic education. The Katz Scale (ADL), which is usually used in the Department of Internal Medicine for patients aged over 65, was implemented to verify the physical efficiency and self-reliance of the participants (http://a.umed.pl/geriatria/pdf/calosciowa_ocena_ger.pdf) [5].

Statistical analyses were performed using Statistica v. 10.0 software made by StatSoft, Poland. The 5% error probability and a $p < 0.05$ significance level were assumed, suggesting the presence of statistically significant differences. Then results are presented in the form of tables and a chart.

Results

1. Analysis of variance for respective anthropometric indices in three studied groups has shown considerable differences in body mass, height, BMI and mean disease duration. The results are shown in Table 1.
2. In all patients, glycated haemoglobin ratio (HbA_{1c}) was measured. Data analysis has shown that patients in groups 2 and 3 displayed much better glycemic control measured by HbA_{1c} ratio, than patients in group 1. The difference was statistically significant ($p < 0.001$). The results for respective groups are presented in Table 2.
3. The differences in systolic and diastolic blood pressure values between the groups were not statistically significant ($p > 0.05$).

Table 2. Comparison of blood tests results between patient groups 1, 2 and 3

Variable	Group 1 (37–58 years) n = 30 Mean ± SD	Group 2 (70–79 years) n = 50 Mean ± SD	Group 3 (≥ 80 years) n = 50 Mean ± SD	p
HbA$_{1c}$ (%)	8.7 ± 2.3	7.3 ± 1.2	6.9 ± 0.9	< 0.001
T-CH [mg/dl]	187 ± 55.3	166.4 ± 48.7	155.3 ± 39.4	0.11
LDL [mg/dl]	110.5 ± 43.8	88.8 ± 33.3	85.6 ± 35.1	0.08
HDL [mg/dl]	39.5 ± 9.1	39.5 ± 9.8	40.5 ± 8.9	0.92
TG [mg/dl]	254.7 ± 20.1	128.7 ± 56.3	113.5 ± 42.1	< 0.001

SD — standard deviation; T-CH — total cholesterol; LDL — low density lipoprotein; HDL — high density lipoprotein; TG — triglycerides
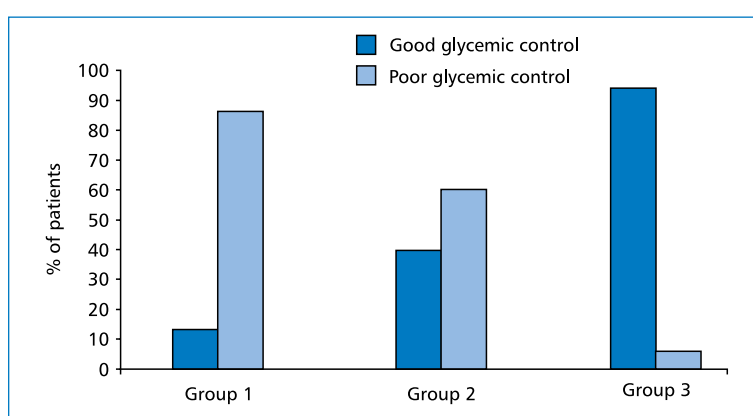
Figure 1. Comparison of metabolic control in respective patient groups

4. Analysis of medical history and documentation has not proved the higher occurrence of hypoglycaemic episodes in older patient groups with better metabolic control (p > 0.05).

Discussion

The results of the study suggest that patient groups 2 and 3 — elderly patients — display significantly better, respective parameters of metabolic control — with the exception of hypertension, were no statistically significant differences between the groups were found. Additionally, it was observed that despite using lower HbA$_{1c}$ threshold (HbA$_{1c}$ < 8%) set for this age group, these patients often fulfil more strict criteria for glycaemic control, usually meant for younger patient groups. Mean value of glycated haemoglobin levels in group 3 consisting of patients aged from 80 to 94 was 6.8% (SD 0.86). The differences in metabolic control regarding carbohydrate metabolism are presented in Figure 1.

According to the IDF, glycated haemoglobin may be the indicator of excessive treatment of diabetes in elderly patients, especially when its blood concentration is lower than 7% or 53 mmol/l [3]. Such low values persisting in patients of older age do not indicate a therapeutic success, but instead signalize a threshold of excessive treatment that requires modification of therapy [3]. Long lasting low HbA$_{1c}$ values are connected with the threat of hypoglycaemia, whose detrimental influence has been proved in many studies, also in the forementioned ACCORD study [3, 6]. Patients of elderly age with long term diabetes may not present typical autonomous symptoms of the central nervous system stimulation due to advanced diabetic neuropathy, while symptoms of neuroglycopenia may be obscured by cognitive disorders typical for this age. Thus, glycaemia values for diagnosis of hypoglycaemia should be higher in elderly patients, and according to IDF guidelines, glycaemia levels of ≤ 70 mg/dl should be treated as a biochemical indicator of hypoglycaemia [3].

A typical lipid profile of a type 2 diabetes patient is distinguished by persistent hypertriglyceridemia and decreased HDL cholesterol levels. Concentrations of LDL cholesterol are usually within normal range or only slightly elevated. However, the structure of LDL particles is altered, as so called small, dense LDL particles are created [7]. A rise in triglycerides concentrations typical

for type 2 diabetes patients is a significant risk factor of cardiovascular diseases and death [8–11]. The comparison of the patients' results in three studied groups showed a better control of triglycerides concentrations in elderly patients, especially in group 3 (p = 0.003) No such pattern was observed in HLD cholesterol concentration levels (p = 0.63).

Better metabolic control of lipids among group 2 and 3 patients compared to group 1 patients, can probably be attributed to weight loss and the use of statins in these groups, in which their beneficial effect on lipid metabolism has been proved in numerous clinical studies [11]. However, the above analysis may be, to some extent, incorrect, as not all of hospitalized diabetic patients had the lipidogram blood test taken during their stay at the clinic, depending on the decisions of their physicians. A full lipidogram was performed in 70 hospitalized patients, whereas 60 patients did not have the test done. It is a matter of concern, as lipid control is necessary in each diabetic patient, regardless of age. In case of type 2 diabetes patients a prophylactic lipidogram should be taken once a year, while in patients with pre-existing dyslipidemia or concomitant cardiovascular diseases — at least every 6 months.

In 111 (85.4%) diabetic patients hypertension was also diagnosed. Regardless of previous diagnoses, each participant had a single blood pressure measurement performed. According to guidelines concerning blood pressure control in type 2 diabetic patients, systolic blood pressure values should remain below 140 mm Hg, while diastolic blood pressure values should remain below 90 mm Hg.

Analysis of the extent of blood pressure control, based on the measurement taken at the clinic, has proved no statistically significant differences between the studied groups. This is most likely because of similarly effective hypotensive treatment implemented in the respective age groups.

During the study, remarkably good glycemic control — expressed as low glycated haemoglobin concentration values — was observed among elderly patients with long lasting type 2 diabetes, which may suggest a higher occurrence of hypoglycaemic episodes in these patient groups. However, a careful analysis of medical history and documentation did not confirm this correlation. Eleven patients aged 70 or older and one younger patient declared having one severe hypoglycaemic episode requiring hospital stay during the year prior to the study. Nevertheless, it must be considered that elderly patients with long lasting diabetes and consequent advanced diabetic neuropathy often do not experience hypoglycaemic symptoms or associate them with their concomitant diseases. In addition,

even in case of typical and well-pronounced symptoms of hypoglycaemia, elderly patients are not able to perform a blood test with a glucose meter because of disabilities, mainly vision impairment. As a result, some of mild hypoglycaemic episodes remain undiagnosed, which no further correction of intensity of antiglycaemic treatment. Insufficient patient education regarding hypoglycaemia should also be factored in, as it may also lead to low rate of hypoglycaemic episodes reported during medical appointments.

Conclusions

Pharmacological treatment of type 2 diabetes in patients aged from 70 to 79 or over 80 often leads to excessive control with respect to the carbohydrate metabolism in these patient groups. Elderly patients also present better control of lipid metabolism, whereas blood pressure values do not differ significantly in relation to age and duration of the disease. Furthermore, no higher occurrence of hypoglycaemic episodes is observed in older patients. This is probably caused by lack of hypoglycaemic education and rarely performed self monitoring of blood glucose levels, leading to very low number of hypoglycaemic episodes being reported during appointed visits.

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