Research Paper

Medical Science

The development of health and functional status in elderly diabetics living in their own environment – the 7 years follow-up.

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ABSTRACT

The aim of study was to assess the development of the health and functional status of elderly diabetics during 7 years follow up.

Patients and methods. Group of 161 patients, 101 women and 60 men above 65 years living in their own environment was studied as for complex geriatric assessment parameters and other health status parameters development, diabetics and non diabetics of studied group were compared at the set intervals of 18, 30 and 36 months..

Results. Studied (73.2+6.48 years) comprised 52 diabetics, 12 out of 52 diabetics and 30 out of the 109 non-diabetics died during the study (ns). The MMSE changed from 27.63 + 1.7 points, range 24-30 points to the final 26.2 + 4.5 points, range 14-30 (ns).

The results of the depression scale show a trend towards a statistically significant increase in the incidence and severity of depression. Metabolic serum parameters were significantly worse in diabetics at the start of the study, but the difference lost its significance during the study.

Conclusions. Interventions against risk factors of cardiovascular damage were more effective in the group of diabetics. This may explain the comparable mortality of the latter despite their higher morbidity. In general, more consistent continuous monitoring of the elderly population as a tool for early diagnostics, therapy and self-sufficiency appears to be effective.

KEYWORDS : diabetes in elderly – self-sufficiency – depression – cognitive

Introduction

Around 70 000 diabetics are newly diagnosed in Czech Republic annually (1, 2, 3). The dynamics of diabetes development in our population over the past 5 years are shown in Table 1. Graph 1 depicts the distribution of type 2 diabetes incidence in various age categories.

number of diabetics and their treatment	2007	2012
alltogether	754 961	841 227
treated by GPs	116 008	165 990
treatment		
diet	223 738	119 538
oral antidiabetics	405 188	708 085
Inzulin	168 018	209 102
number of newly diagnosed patients	56 398	72 063
deaths per year	22 869	23 886

Table 1 Disease development in the Czech population over the past 5 years
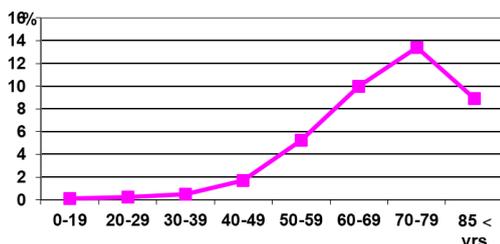
Graph 1 Percentage of diabetics in individual age categories

Diagnostics

The largest proportion of new diabetics is diagnosed during preventive examinations or the diagnosis is made incidentally, for example as part of routine pre-operative assessment prior to planned surgery. The average duration of laboratory and somatic changes preceding the development of type 2 diabetes itself is estimated to be 5-7 years (4, 5).

Adaptation to the disease

Once diabetes is diagnosed, the manner in which the new diabetic is appropriately educated regarding his/her disease is absolutely crucial (6). The running values of randomly sampled glycaemia in diabetics with such an approach to their illness then range over a long period of time between the absolutely unsatisfactory values of 10-15 mmol/l or glycated haemoglobin levels of 100 mmol/l and higher. There is also progression of lipid disorders and other components of the metabolic syndrome and this consequently accelerates the progression of cardiovascular damage, the decrease in self-sufficiency and leads to a more dramatic onset of cognitive disorders (7).

The consequences of continuously higher glycaemia values must be stressed repeatedly, especially to those diabetics who lack any experience with the course of diabetes among their family and friends. They should also be encouraged to buy a blood glucose meter and to check their glycaemia from time to time at home, similarly as patients suffering from hypertension are encouraged today to monitor their BP. In type 2 diabetics, complete self-monitoring in the home environment has led to a significant improvement in glycated haemoglobin levels (8).

Patients must be complexly informed and educated about insulin resistance and its role in the development of type 2 diabetes and

the metabolic syndrome as a whole – it is very effective when in direct contact with the patient to use one of the original terms for this syndrome, the emotionally charged „ Kaplan deadly quartet". (9)

The diabetic patients as a geriatric patient

Non-compliance is one of the principal causes of the acceleration of diabetes complication development and the accentuation of the negative effects of diabetes on patient overall state of health and self-sufficiency. On one hand, it has been repeatedly demonstrated and generally accepted that long-term glycaemia elevation affects the endothelium of capillaries and increases the rapidity of developing micro and macro-vascular complications (10, 11). On the other hand, the negative and usually only incompletely reversible effects of acute diabetes complications not only on somatic diseases but also on the progression and decline of cognitive disorders leading to further worsening of compliance must also be kept in mind. In recent years, the risk of hypoglycaemia has led to the moderation of the criteria for target glycated haemoglobin levels (12, 13, 14)

In general, the causes of non-compliance should be sought in various areas- apart from the patient him/herself, his/her diabetes, his/her treatment, comorbidities and degrees of self-sufficiency, the current economic situation and conditions within the healthcare system must also be taken into consideration (15).

One of the sporadic Czech studies dealing with compliance of the elderly uncovered a significant discrepancy between the realistic values of ADL (activities of daily living), IADL (instrumental activities of daily living) and MMSE (mini mental state evaluation) and the self-evaluation of the geriatric patient- 75% of patients stated during a directed interview that they never forget to take their medication and always ensure that they have a new package ready, but more than one half of the patients had problems determining the exact number of different medication that they were taking and only 13% of patients knew exactly what medication and for what disease they were taking (16). As soon as the values of the MMSE approach 25-23 points, it is necessary to thoroughly objectify the medical history data with family and carers and to begin organising on one hand more detailed examination and treatment of the cognitive deficit and on the other assistance with taking medication, insulin administration, checking glycaemia at home and preparing food of appropriate composition and timing.

B) Factors arising from the recommended treatment – excessively complex medication schemes lead to an accumulation of medication errors (17, 18). Oral antidiabetic agents such as sulphonylurea are listed among potentially unsuitable drugs for the elderly given their potential interactions and especially the risk of protracted hypoglycaemia (19, 20). In the case of the newer thiazolidinedione group, the possibility of a negative effect on myocardium contractility is being discussed and a higher risk of hypoglycaemia has been demonstrated in the case of repaglinide. (21). The rising polymorbidity in older age requires a highly individualised approach to the choice of medication- this fact has led to a gradual deviation from the therapeutic scheme that until recently predominated in human medicine to one where medicine is truly able to model the most rational and most effective treatment for a concrete patient (22)

Patient sample and methods

In order to assess the overall development of the health and functional status of elderly diabetics we used a sample of 161 elderly patients, 101 women and 60 men over the age of 65 years living in their own environment who are followed over the long term at our department in cooperation with general practitioners. Apart from a basic physical examination and basic laboratory tests, the examination of the studied sample at the start of the monitoring and at set intervals of 18, 30 and 36 months also focused on components of the metabolic syndrome– glycaemia, lipid metabolism and tested the intellectual capabilities, depressivity and self-sufficiency using the MMSE (mini mental state examination), ADL (activities of daily living), IADL (instrumental activities of daily living) and the Sheikh and Yesavage depression scale (23,24,25,26). A list of the diagnoses and a list of the medication taken regularly were also drawn up.

All the elderly subjects were examined in accordance with this unified protocol in January 2006, July 2007, January 2010, and January 2013. Evaluation of the collected data of the studied sample was performed using the

T-test, χ-quadrat test and correlation analysis.

Results

The examinations in accordance with the set protocol were undertaken by a total of 161 elderly subjects, 61 men and 100 women with an average age of 73.2+6.48 years. At the beginning of the study, the diagnosis of diabetes mellitus was present in 32 patients. By the 84th month a further 17 subjects were diagnosed. The total number of diabetics in the studied sample was thus 52, 29 women and 23 men, with an average age of 73.03 + 5.46 years at the beginning of the study and 78.39 + 4.05 at the end of follow-up. These were patients with type 2 diabetes managed with diet (47% of the sample at the beginning, 31% at the end of follow-up), diet and oral hypoglycaemic agents (53% at the beginning, 69% at the end). Insulin was part of the treatment regimen in only 1 patient at the beginning and in 4 patients at the end of follow-up. The average glycaemia values of the diabetics at the beginning of follow-up were 6.87+2.06 mmol/l, range 3.9 – 12.6 mmol/l. The value in non-diabetics was 5.15+0.68, range 4.3 – 6.7 mmol/l. Further tests revealed glycaemia values that differed only slightly. During the course of the study, 12 out of 52 elderly diabetics and 30 out of the 109 elderly non-diabetics died. This difference was not statistically significant.

From the aspect of functional assessment, the average cognitive performance of diabetics evaluated using the MMSE changed from the initial values of 27.63 + 1.7 points, range 24-30 points to the final 26.2 + 4.5 points, range 14-30. Graph 2 shows a comparison with the group of non-diabetics of similar average age. The differences are not statistically significant.
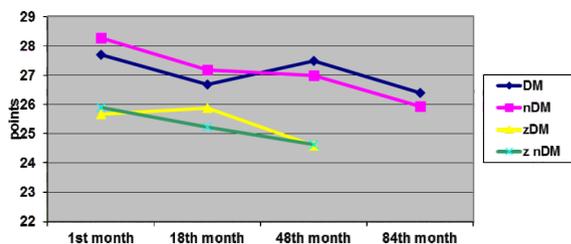
Graph 2 Course of MMSE values during the seven-year follow-up
(DM – diabetics, nDM – non-diabetics, zDM deceased diabetics, znDM deceased non-diabetics)

The average values ADL and IADL of diabetics and non-diabetics differed minimally and fell in the case of ADL from the initial 97.7+3.8 points, range 90-100 to the final 93.7+8.8, range 65-100 points. In the case of IADL, they fell from the initial 78.2+6.0, range 50-80 to the final 66.4+19.1, range 10-80 points.

The results of the depression scale show a trend towards a statistically significant increase in the incidence and severity of depression in the studied sample, in both diabetics and non-diabetics, whereby significantly worse results were demonstrated by the patients who died during the follow-up- see Graph 3.
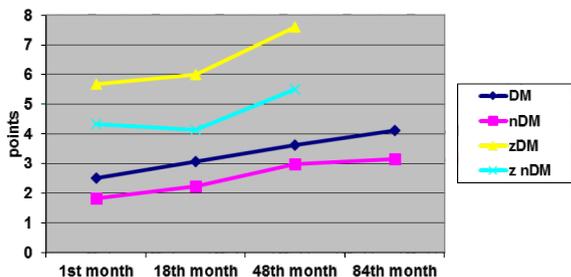
Graph 3 Course of the depression scale values during the seven-year follow-up (DM – diabetics, nDM – non-diabetics, zDM deceased diabetics, znDM deceased non-diabetics)

From the aspect of multi-morbidity, the average number of diseases recorded in the documentation of diabetics ranged from 4.38 + 2.22 at the beginning of follow-up to 9.54 + 3.58 at the end of follow-up. In the group of similarly aged non-diabetics, this was 4.1 + 2.19 at the beginning and

9.1 $\pm$ 3.4 diseases at the end of follow-up. The difference was not statistically significant for the whole period of follow-up. In contrast, throughout the follow-up, diabetics were treated with a statistically significantly greater number of medication (6.7$\pm$2.6, range 1-12 types of drugs in diabetics; 4.8$\pm$2.4, range 0-11 types of drugs in non-diabetics)

The most frequent concomitant diseases and the course of individual comorbidities in the individual stages of follow-up is shown in Table 2.

	HT	ICHS	HLP	OA	VAS	COM	HU	VCH	OP	OB	ICHDK	RI	BHP
1st month	37	24	24	3	2	8	4	7	1	6	4	5	5
18th month	7	7	4	9	4	3	8	2	4	0	1	2	0
48th month	3	5	3	4	4	5	1	0	3	1	1	0	0
84th month	1	3	3	7	8	1	1	0	0	1	0	3	1
DM tot	48	39	34	23	18	17	14	9	8	8	6	10	6
DM%	92,3	75	65,4	44,2	34,6	32,7	26,9	17,3	15,4	15,4	11,5	19,2	11,5
1st month	28	19	26	17	31	7	10	8	8	3	5		8
18th month	12	12	10	9	9	5	5	1	8	0	1	3	3
48th month	10	10	12	14	8	12	4	1	8	1	2	5	6
84th month	2	4	7	4	6	4	3	0	3	0	0	1	4
nDM tot	52	45	55	44	54	28	22	10	27	4	8	9	21
nDM%	47,7	41,3	50,5	40,4	49,5	25,7	20,1	9,2	24,8	3,7	7,3	5,5	19,3

Table 2
Course of comorbidities recorded in the documentation of diabetics and non-diabetics during the individual stages of the follow-up
(HT- hypertension, ICHS – ischaemic heart disease, HLP – hyperlipidaemia, OA – osteoarthritis, VAS – vertebral algic syndrome, COM - cerebrovascular disease, HU – hyperuricemia, VCH – peptic ulcer disease, OP – osteoporosis, OB – obesity, ICHDK – ischemic peripheral arterial disease, RI – renal insufficiency, BHP – benign prostatic hyperplasia, DM – diabetics, nDM non-diabetics)

The average weight of diabetics (81.7 $\pm$12.3 kg, range 57-106kg) throughout the follow-up was statistically significantly greater than in non-diabetics (75.5 $\pm$ 12.2 kg, range 52-112 kg). A similar trend was also demonstrated by BMI. However, the average BMI values in both diabetics and non-diabetics met the parameters of excess weight (29.7$\pm$4.1, range 20.4 – 49.3 vs 27.7$\pm$4.1, range 20.8 – 46.0, p<0.01).

A remarkable fact is that although the incidence of dyslipidemia in diabetics was nearly statistically significantly higher – $x^2 = 3,24$, the real value of cholesterol and LDL cholesterol in diabetics was lower throughout the follow-up period, and statistically significantly so in the last two examinations. The level of triglycerides in diabetics at the beginning of follow-up was statistically significantly higher, but over the course of the follow-up it neared the levels in non-diabetics and the difference lost its statistical significance.

A similar situation arose in the case of hyperuricemia - during the follow-up, the number of patients diagnosed with hyperuricemia tripled in the group of diabetics and doubled in the group of non-diabetics. The difference in uric acid levels lost its statistical significance during the follow-up.

Discussion

The incidence of diabetes in the studied sample is significantly higher than that in the general population. This is a sample selected randomly from among subjects who are already seeing their general practitioner for some reason or the other and whose morbidity is thus higher. However, the sample did not include type 1 diabetics who are usually systematically followed in specialised diabetology outpatient clinics.

The parameters that we usually use to infer the actual degree of self-sufficiency of patients, ADL, IADL a MMSE, exhibited a gradual tendency to decrease. However, there was no significant difference in the

rapidity of decline between diabetics and non-diabetics. Thus, in this sample, the principal factor behind this decline appears to be the increasing age of the patients.

From the aspect of compliance, we consider the trend of increasing values of the geriatric depression scale during follow-up to be significant. These changes were more significant in diabetics than in non-diabetics. Changes in the patient´s behaviour and in his/her approach to treatment associated with depression may significantly worsen the patient´s prospects. In general, appropriate attention has not been paid to this aspect to date (27).

Monitoring of the incidence of comorbidities led to the expected finding- a frequency of hypertension nearing 100% inviting greater vigilance and diligence in the treatment of hypertension during the long-term follow-up of elderly patients suffering from diabetes (28). Treatment of diabetics with a significantly higher number of medicaments further increases the risk of medication errors, especially as cognitive functions gradually decrease and age increases.

The most intriguing finding in the whole studied sample is the course followed by serum lipid and uric acid levels, which demonstrated during the follow-up a significant trend towards improvement or normalisation. The question remains, whether this trend was due to more systematic monitoring and pharmacotherapeutic interventions in diabetics or the realisation that regular check-ups are involved and the dread of uncomfortable situations during visits if unsatisfactory results are uncovered, or whether diabetics are truly conscious of the risk of possible complications and are thus more disciplined. This possibility appears to be the logical explanation, but it is not completely supported by data in literature (29). Another explanation for this trend in the studied sample could also be the age of the patients, as adherence of older diabetics is often reported as being better compared to youn-

ger diabetics (30)

Nonetheless, the practical impact of the favourable course of blood lipid levels can be seen on the favourable course of the self-sufficiency ADL and IADL tests as well as on the MMSE cognitive testing, whereby the initially non-significantly worse values in diabetics developed in a similar manner during the follow-up as in non-diabetics.

Conclusions for clinical practice

- During the long-term follow-up of elderly diabetics, attention must also be paid to mental and psychological changes-especially to the possible gradual increase in depressivity.

- Compared to the group of elderly non-diabetics, interventions against risk factors of cardiovascular damage were more effective in the group of diabetics. This may explain the comparable mortality of the latter despite their higher morbidity.

- From the aspect of long-term care for diabetics, attention must be paid to all comorbidities, especially to consistent interventions relating to components of the metabolic syndrome.

- In general, more consistent continuous monitoring of the elderly population as a tool for early diagnostics, therapy and self-sufficiency appears to be effective.

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