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Diabetes care among older adults in primary care in Austria

A cross-sectional study

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Summary

QUESTIONS UNDER STUDY: The prevalence of diabetes mellitus in the older population is high, but hardly any data are available on current diabetes care in the primary care setting. We aimed at investigating the diabetes management of older patients with type 2 diabetes (T2DM) in the primary care setting, including adherence to current guidelines, comparing patients aged 70–79 years to those aged 80 years and above.

METHODS: From November 2008 through March 2009 a total of 23 primary care physicians and one consultant in internal medicine consecutively enrolled 203 unselected patients with T2DM aged ≥70 years.

RESULTS: From the 203 study participants 66% were 70–79 years of age, and 34% were 80 years or older. Mean HbA1c and LDL-cholesterol were not significantly different between the older and the younger age group (7.6 ± 1.6 vs. 7.1 ± 0.9%; p = 0.080; and 122 ± 40 vs. 114 ± 34 mg/dl; p = 0.273), whereas BMI was lower (27.5 ± 5.0 vs. 29.6 ± 5.0 kg/m^2, p = 0.010), and the prevalent rates of coronary heart disease (55.1 vs. 37.1%, p = 0.011) and of dementia (29% vs. 6.1%, p = 0.001) were higher in the older age group. LDL-cholesterol (77.6% vs. 66.7%, p = 0.012), creatinine clearance (34.6% vs. 30.9%, p = 0.049) but not HbA1c (74.6% vs.73.9; p = 0.520) were monitored significantly less often in the older than in the younger age group.

CONCLUSIONS: While glycaemic control on average appears strict, there may be ample room for improvement in reaching lipid targets and in the monitoring of lipid and renal function among older adults in primary care, in particular among individuals aged ≥80 years.

Key words: *type 2 diabetes mellitus; aged; 80 and over; patient care management; primary care; geriatric; diabetes care; elderly*

Introduction

During the past several decades the prevalence of type 2 diabetes (T2DM) has been rising sharply, in particular, among elderly patients [1]. Indeed, the majority of patients with T2DM are older than 65 years [2], and in the age group of 60 to 74 years the current prevalence of diabetes is reaching 20%. Unfortunately, knowledge of diabetes is still mediocre among many health professionals [3].

T2DM confers a series of severe consequences. Most strikingly, older adults with diabetes suffer excess morbidity and mortality compared with older individuals without diabetes [4]. Increased mortality mainly results from a two to threefold increased risk of macrovascular events, in particular coronary artery disease [5]. Microvascular complications such as retinopathy and nephropathy or neuropathy are less important with regard to mortality but have a crucial impact on morbidity and, importantly, on the quality of life among patients with T2DM [6–8].

The complications of diabetes are particularly prevalent among elderly patients. First, the prevalence of diabetes complications increases with extended diabetes duration concurrent with advancing age, and, second, given the high absolute risk of elderly patients regarding morbidity and mortality, the risk increase conferred by the presence of diabetes results in an even greater absolute risk increase than among younger individuals [3, 9]. Conversely, interventions to reduce diabetes complications should result in a particularly high absolute risk reduction among elderly individuals, as has been shown for example for statin treatment [10]. However, heterogeneity in respect to functional capacity and comorbidity poses additional challenges to the management of diabetes in old age. For many healthier older persons treatment goals similar to younger patients may be most appropriate. Frail patients affected by several geriatric syndromes including cognitive impairment [11], falls [12] and depression [13] whose life expectancy is limited, may not benefit from aggressive treatment [13, 14].

In particular, the American Diabetes Association's recommendation for glucose control in patients with diabetes in general is 7.0% and stricter goals are not suggested for elderly individuals. Rather, also higher glucose values than those corresponding to an HbA1c of 7.0% could be tolerated in frail older patients [15]. Recent trials in addition show that the major cause of mortality in patients with diabetes, is macrovascular disease which is not significantly reduced by aggressive glucose control, in particular among patients with co-morbidities [16–18]. Moreover, aiming at very low glucose values increases the risk of hypoglycaemia and the risk of falls, which is of particular relevance for the elderly [19, 20].

The relationship between diabetes and geriatric syndromes is complex, as contributing factors to geriatric syndromes are micro- and macrovascular complications, and geriatric syndromes not only lead to frailty, but also become a major obstacle in the treatment and care of diabetic people [21].

Considering the huge importance of diabetes in the older population the paucity of data on their management in the primary care setting is most disturbing.

In the present study we therefore aimed at investigating the diabetes management of elderly patients, including adherence to current guidelines, in the primary care setting and at comparing the age groups of 70 to 79 years and of 80 years and above.

Methods

From a total of 50 physicians, who were invited by letter and email, 23 general practitioners and one internist agreed to participate in an evaluation of diabetes care of the elderly in the primary care setting in Austria. The 50 physicians, who were originally invited, represented a random sample; the 23 physicians who agreed to participate did not differ significantly demographically from those who declined.

Each of these physicians was asked to include up to ten consecutive patients with T2DM aged seventy years of age or older making an appointment in the office. Institutionalised patients were excluded. According to the study protocol the participating physicians completed the predefined study questionnaire by using their notes from the medical records, without directly involving the patients themselves. The investigation was carried out from November 2008 to March 2009.

The questionnaire was standardised and covered questions about physician characteristics (gender, years of practice) and patient characteristics including age, sex, living conditions, reception of nursing care allowance, duration of diabetes, history of co-morbidities, self-management of blood pressure, self-management of blood sugar and diabetes education by other persons than the practice staff.

Further, weight and height were recorded, and body mass index was calculated as body weight divided by body height in meters squared. Also, waist circumferences and blood pressure were recorded.

The questionnaire further asked whether, and if so, when laboratory measurements had been obtained. Total cholesterol, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, triglycerides, haemoglobin A1c, serum creatinine and microalbuminurea were recorded; the glomerular filtration rate was calculated by the MDRD formula [22]. Additionally, diabetes related medications and major cardiovascular medications were recorded. The study conforms with the declaration of Helsinki and was approved by the local ethics committee.

Statistical analysis

Results are shown as mean values +/– standard deviation if not noted otherwise; between group-comparisons were tested for statistical significance with Chi-squared tests for categorical variables and with Mann- Whitney-U-test for continuous variables, as appropriate. Statistical analysis was performed with the software package SPSS 20.0 for windows (SPSS, Inc. Chicago, US).

Results

Characteristics of the participating physicians

From the 23 participating physicians, 21 (87.5%) were men. Six physicians had been in private practice for up to ten years, seven for 11–20 years, and 11 for more than twenty years.

Patient characteristics

Overall, 203 patients were recruited. Their mean age was 78 years; 134 (66.0%) patients were seventy to seventy-nine years of age, and 69 (34.0%) were eighty years or older. Overall, 56.2% (n = 114) of our patients were female, 34% (n = 69) were living alone and 32% (n = 65) were receiving nursing-care allowances. The mean BMI in our patient population was 28.6 ± 5.0 kg/m^2, and the mean waist circumference was 101 ± 13 cm. The average duration of diabetes was 6.3 years.

From our patients, 58.6% were receiving metformin, 38.9% sulfonylurea, 8.4% glitazones and 22.2% insulin treatment, alone or in combination, respectively.

Laboratory results

HbA1c values had been obtained in 63% of our patients within the preceding three months, in 74% within the past six months and in 88% within the previous year, respectively. The median value of the most current HbA1c measurement was 7.0% (interquartile range 6.5–7.8%). The proportion of patients with an HbA1c <8.0% was 77.8%. An HbA1c <7.0% was observed in 45.5%, and an HbA1c ≤6.5% in 25.9% of our patients.

Overall, lipid parameters had been obtained within the past year in 83% of our patients. Specifically, total cholesterol had been measured in 83%, HDL-cholesterol in 78%, LDL-cholesterol in 69%, and triglycerides in 70%. LDL-cholesterol was <100 mg/dl in 26% of our patients and <70 mg/dl in 13%.

Serum levels of creatinine had been obtained during the past year in 84% of the enrolled patients and the glomerular filtration rate had been calculated in 33%. The mean serum creatinine was 1.0 ± 0.5 mg/dl and the mean GFR 52 ± 30 ml/min/1.73 m^2.

Age subgroups

From our patients, 134 (66.0%) were younger than 80 years and 69 patients were 80 years and older. Table 1 summarises patient characteristics in both age subgroups. The rates of coronary heart disease and of dementia were significantly higher in those aged 80 years and above. This age group also showed significantly lower weight and BMI. Foot ulcers as well as pain syndromes, urinary incontinence and depression were highly prevalent in both age groups. Prescription of cardiovascular medication did not differ between both age groups. Concerning diabetes-related medication Metformin was significantly less often prescribed in the age group of 80 years and above. In both age groups, every fifth patient was treated with insulin. Table 2 shows diabetes-related and major cardiovascular medications in the age groups.

HbA1c, lipid and renal parameters in the two age groups are shown table 3. HbA1c values were <8.0% in 77.2 and 79.0% (p = 0.464) and <7.0% in 45.7% and in 45.2% (p = 0.536) of the patients aged 70–79 years and >80 years, respectively. An HbA1c < 6.5% was observed in 26.8% of the patients in the younger, and in 24.2% of the patients in the older age group, respectively (p = 0.423).

With respect to lipid parameters there were no significant differences in cholesterol, HDL cholesterol, LDL cholesterol, and triglycerides between the younger and the older age group. Also, the proportion of patients reaching an LDL cholesterol goal <100 mg/dl or an LDL cholesterol goal <70mg/dl did not differ significantly between the age groups and was low in both age subgroups (table 4). Further, serum levels of creatinine and the glomerular filtratrion rate were not significantly different between the two age groups.

Whereas the monitoring frequency of HbA1c, serum creatinine and glomerular filtration rate did not differ significantly between patients aged 80 years and above and patients aged 70–79 years, in the older patients lipid parameters and the eGFR were monitored less often (table 4).

Discussion

While HbA1c on average appears remarkably low, there may be room for improvement in reaching lipid targets and in the monitoring of lipid and renal function among many older adults in primary care. Importantly, however, in geriatric patients an individualised approach, which takes into account comorbidities is warranted.

This is the first report on diabetes care in elderly patients in the primary care setting from central Europe. Therefore, our data are of particular importance for this region. However, because there is a general lack of data on geriatric patients with diabetes, our data are also of broader relevance.

Diabetes is diagnosed on the basis of blood glucose levels, and glucose control is a central aim in diabetes management [23]. The median HbA1c value in our patient population was 7.0%, which is remarkably low. More-over, nearly 30% of all patients aged 70 to 79 years and 15% in the age group of 80 years and above showed median HbA1c values lower than 6.5%.

Concordant with the strongly increased risk of cardiovascular disease among diabetic patients more than half of our patients had a history of coronary artery disease, with a significantly higher CAD prevalence in the age group of 80 years and above. Cardiovascular risk in patients with a combination of coronary artery disease and diabetes is extremely high [24] and, as already mentioned above, cannot be significantly reduced by intense glucose lowering. However, clinical trials have shown that diabetic patients, and in particular the extremely high-risk stratum of diabetic

Table 1: Comparison of baseline characteristics between age groups.

Variables	**70–79 years n = 134**	**≥80 years n = 69**	***P*-value**
Sex, female (%)	53.4	63.8	0.105
Living alone (%)	31.8	39.1	0.189
History of			
Coronary heart disease (%)	37.1	55.1	0.011
Myocardial infarction (%)	18.9	17.4	0.474
Congestive heart failure (%)	22.7	30.4	0.154
Two or more falls during the preceding year (%)	14.4	23.2	0.087
Fractures after the age of 50 years (%)	10.6	17.4	0.128
Depression (%)	34.8	27.5	0.187
Dementia (%)	6.1	29	0.001
Urinary incontinence (%)	26.5	31.9	0.261
Foot ulcer (%)	10.6	8.7	0.436
Chronic pain (%)	30.3	29	0.490
Eye screening during preceding year (%)	65.2	58	0.199
Self-blood pressure monitoring (%)	56.1	60.9	0.308
Diabetes education training other than in general practice (%)	49.2	43.5	0.265
Waist circumference (cm)	101 ± 13	100 ± 12	0.503
Systolic blood pressure (mmHg)	134 ± 14	137 ± 16	0.583
Diastolic blood pressure (mmHg)	79 ± 9	77 ± 8	0.345
Height, (cm)	165 ±9	163 ± 4	0.069
Weight, kg (cm)	80 ± 15	72 ± 13	0.001
BMI (g/m^2)	29.6 ± 5	27.5 ± 5	0.010
P-values are derived from Chi-squared tests for categorical variables and from Mann-Whitney-U-tests for continuous variables.			

CAD patients, significantly benefit from lipid-lowering treatment with statins [25].

However, only about 66% of our patients received statins. Concordantly, LDL-cholesterol targets were met only in an insufficient proportion of our patients. There is room for improvement with regard to lipid management, in particular with regard to statin therapy.

The prevalence of foot ulcers in our patient population was as high as 10% in both age groups. Given the greatly increased risk of patients with foot ulcers which lead to local complications such as amputation, this underlines the necessity for routine foot examinations in geriatric patients with diabetes. Moreover, foot ulcers in patients with diabetes are a strong marker for increased cardiovascular risk and increased mortality [26]. More stringent risk factor control therefore is necessary in these extremely high-risk patients.

In our study patients of both age groups were on average overweight. However, values for BMI and weight were significantly lower in patients aged ≥80 years. Of note, a low BMI has been shown not to be an advantage but a strong predictor of overall mortality in older persons [27]. Recently, longitudinal studies have demonstrated that for people who have survived to the age of 70, mortality risk is lowest in those with a BMI classified as overweight according to the World Health Organization categories.

More recent data clearly showed that impaired kidney function is a strong risk factor for cardiovascular disease,

Table 2: Comparison of diabetes-related and of major cardiovascular medications between age groups.

Variables	**70–79 years n = 134**	**≥80 years n = 69**	***P*-value**
Insulin (%)	23.5	20.3	0.371
Aspirin (%)	48.5	53.6	0.294
Clopidogrel (%)	9.1	10.1	0.496
Acenocoumarol (%)	15.9	18.8	0.367
Statins (%)	68.9	60.8	0.161
Angiotensin converting enzyme inhibitors (%)	53	58	0.302
Angiotensin II receptor blockers (%)	19.7	29	0.096
Calcium antagonists (%)	25.8	37.7	0.057
Beta-blockers (%)	45.5	34.8	0.095
Diuretics (%)	46.2	56.5	0.108
Metformin (%)	65.2	44.9	0.005
Sulfonylurea (%)	39.4	37.7	0.468
Glitazones (%)	9.1	7.2	0.438
Sitagliptine (%)	6.1	1.4	0.124
P-values are derived from Chi-squared tests for categorical variables and from Mann-Whitney-U-tests for continuous variables.			

Table 3: Comparison of HbA1c, lipid and renal parameters between age groups.

Variables	**70–79 years n = 134**	**≥80 years n = 69**	***P*-Value**
Mean HbA1c during the preceding 6 months (%)	7.1 ± 0.9	7.6 ± 1.6	0.080
Cholesterol during the preceding 24 months (mg/dl)	202 ± 65	200 ± 40	0.808
HDL cholesterol during the preceding 24 months (mg/dl)	50 ± 17	49 ± 14	0.643
LDL cholesterol during the preceding 24 months (mg/dl)	122 ± 40	114 ± 35	0.273
Triglycerides during the preceding 24 months (mg/dl)	164 ± 97	147 ± 67	0.655
Serum creatinine during the preceding 24 months (mg/dl)	1.0 ± 0.5	0.99 ± 0.4	0.901
Glomerular filtration rate during the preceding 24 months (ml/min.1.73 m^2)	55 ± 25	55 ± 8	0.875
P-values are derived from Chi-squared tests for categorical variables and from Mann-Whitney-U-tests for continuous variables.			

Table 4: Guideline Adherence.

Variable	**70–79 years n = 134**	**≥ 80 years n = 69**	***P*-Value**
HbA1c obtained during the preceding 6 months (%)	74.6	73.9	0.520
HbA1c obtained twice in proceeding 12 months (%)	27.6	20.3	0.167
Total cholesterol obtained during the preceding 12 months (%)	85.8	73.9	0.001
HDL cholesterol during preceding the 12 months (%)	78.4	63.8	0.021
LDL cholesterol obtained during the preceding 12 months (%)	77.6	66.7	0.012
Triglycerides obtained during the preceding 12 months (%)	74.6	60.9	<0.001
Serum creatinine obtained during the preceding 12 months (%)	83.6	87.0	0.340
Glomerular filtration rate (ml/min.1.73 m^2)	34.6	30.9	0.049
HbA1c <6.5%	26.8	24.2	0.423
HbA1c <7.0%	45.7	45.2	0.536
HbA1c <8.0%	77.2	79.0	0.464
LDL cholesterol <100mg/dl	26.8	25.2	0.205
LDL cholesterol <70mg/dl	14.5	11.5	0.130
P-values are derived from Chi-squared tests for categorical variables and from Mann-Whitney-U-tests for continuous variables.			

both among patients with diabetes and among non-diabetic individuals [28–30]. Diabetes is the major cause of kidney impairment in the Western world. Therefore, current guidelines recommend routine screening of kidney function among diabetic patients [31]. While serum creatinine values had been obtained in four out of five of our patients, only in every third the eGFR had been calculated; the proportion of patients for whom an eGFR had been calculated was even lower in the age group ≥ 80 years.

Another important diabetes complication, retinopathy was screened for in 62.6% of our patients. By far not all patients in both age groups were routinely sent for ophthalmological evaluation, as is recommended by current guidelines. Also urinary incontinence, pain, and psychiatric disorders, in particular dementia and depression were highly prevalent in our geriatric patients with diabetes. Dementia was recorded in a third of all patients in the age group ≥80 years, which was significantly higher than in the lower age group. Because these disorders strongly hamper the compliance of diabetic patients and make their management difficult, these results deserve particular attention.

Of note, cost-efficacy for screening measures in the elderly has not been thoroughly established. Further, clinical trial data suggest that overly aggressive glucose lowering is rather harmful than beneficial, in particular among the elderly [32], [33]. With regard to LDL cholesterol lowering by statins, however, meta-analyses do not suggest that the relative cardiovascular risk reduction in elderly patients is any lower than in younger individuals, and, given the higher absolute risk in the elderly the given relative risk reduction translates into an even higher absolute risk reduction than in younger individuals [34, 35]. Also, both pathophysiological considerations and clinical trial data [36, 37] suggest an early benefit from statin treatment (not just a benefit appearing after several years) and endothelial function is improved within three days of initiating statin therapy [38]. When the treatment aim is to prevent myocardial infarction or stroke (which is the case not in all but in many elderly patients), statin treatment appears reasonable in many elderly patients with diabetes.

Despite this, it should be considered that in the group of patients older than 80 years, there is no evidence in the scientific literature that lipid lowering therapy improves life expectancy, and there is not a single study which looked at the effect of lipid lowering on CHD in diabetic subjects older than 80 years. Thus, a one size fits all statement regarding lipid management or, in particular lipid treatment goals does not appear to be justified for the elderly.

Importantly, the current ESC / EAS guidelines on the management of dyslipidaemia state [39] that "evidence for treatment above the age of 80–85 years is very limited, and clinical judgment should guide decisions in the very old". The same guidelines however also give a class IB recommendation for statin treatment in elderly subjects with CAD "in the same way as for younger patients" and a class IIbB recommendation for the consideration of statin use in elderly subjects who are free of cardiovascular disease, particularly in those who have at least one other risk factor besides age (which of course is the case in patients with diabetes). In summary, a patient oriented, individualised approach to lipid management appears necessary in geriatric patients, which must take into consideration life-expectancy and individual comorbidities. With regard to blood pressure therapy, the HYVET-trial provides direct evidence of benefit through blood-pressure lowering in the elderly [40].

The 2012 clinical practice recommendations of the American Diabetes Association recommend HbA1c values of <7.0% as a general goal, but emphasise the need to individualise this treatment goal, in particular among geriatric patients [41]. The most recent EASD/ADA guidelines stated that glycaemic treatment goals should be individualised [42]. These authors emphasised that the intensity of glycaemic therapy should be balanced according to patient attitude and self-care capacities, risks potentially associated with hypoglycaemia, life expectancy, comorbidities, and presence of vascular complications. Most of these criteria are present in the very old, particularly those included in our study. For geriatric patients with diabetes, a goal of <8.0% has been proposed [15] in our investigation, 45.5% and 77.8% met the 7.0% and the 8.0% HbA1c goals, respectively. Individualisation of therapy, however, appears more important than a quantitatively defined treatment goal in the elderly with regard to glucose lowering.

The same holds true for lipid therapy. Current guidelines recommend an LDL cholesterol goal of <100 mg/dl [43] or even <70 mg/dl [44]. 13% and 26% of our patients met the <70 mg/dl and the <100 mg/dl LDL cholesterol goals. With respect to screening frequencies, 93.1% of our subjects received measurement of HbA1c at least twice a year, and 66%, 33%, and 82% measurement of LDL cholesterol, urine albumin excretion and creatinine at least once a year, respectively, as recommended in current treatment guidelines [43]. Of note, it definitely remains arguable whether strict adherence to these guideline goals, which were derived from observations made among younger patients, is beneficial for the elderly. Also cost efficacy is an important issue in this respect. Individual judgment of the overall comorbidities and the quality of life is certainly more important than general recommendations, which are derived from younger subjects.

Important strengths of this study are the recruitment of consecutive patients from a primary care setting. Few data at all, are available on the care of geriatric patients with diabetes in general [4, 45, 46], and in particular no data are available for the region of central Europe. Another strength is the use of standardised questionnaires.

In order to obtain a representative sample of patients we invited a random sample of physicians to participate in our investigation and instructed them to collect data on unselected series of consecutive patients. Limitations of our study are the moderate sample size (which means less possibility for between-group comparisons) and the restriction to a single geographic region. Further, the incidence of hypoglycaemia was not recorded in our investigation. However, it does not appear very likely that the relatively low HbA1c values in our study population were due to an extraordinarily high incidence of hypoglycaemia. Lower HbA1c values in patients within the primary care setting, when compared to the patients treated in specialised diabetes outpatient clinics are very well in line with the literature [47]. GPs will generally refer the more complicated

patients, whose HbA1c is more difficult to lower to target, to secondary or tertiary care centres. Finally, by design our study included elderly patients and not younger individuals. Our data therefore do not allow a direct comparison between the management of geriatric patients and younger individuals with diabetes.

In conclusion, we provide the first data on patient care among geriatric diabetes patients in central Europe. While glucose control may be too stringent for very old patients with high comorbidity, there may be room for improvement in reaching lipid targets and in the monitoring of lipid and renal function among many older adults in primary care. Importantly, however, in geriatric patients an individualised approach, which takes into account life-expectancy and comorbidities is warranted.

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