Risk factors and management of diabetes in elderly French patients

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Abstract

Aims. – The aim of this study was to assess the characteristics of elderly diabetic patients, evaluate the relationship between glycaemic control and diabetes complications, and compare the day-to-day management of such patients with the published recommendations.

Methods. – The study included 238 elderly diabetic patients, for whom data for the past six months’ medical history, clinical examination (including ocular fundus) and standard biological tests were collected.

Results. – The patients’ mean age was 82.2 ± 7.2, HbA1c value was ≥ 8.5% in 24% of patients and the mean number of cardiovascular risk factors (CVRF) was 4.1 ± 0.7 per patient. Dementia or cognitive impairment was present in 68% of patients. Estimated glomerular filtration rate was 30 mL/min or lesser than 16%. Retinopathy was present in 37% of patients, and 64% had a history of infection in the past six months; more than 50% of patients took insulin. The prevalence of retinopathy, cognitive dysfunction and infections were significantly less frequent in patients with HbA1c ≤ 6.5%. There was a positive correlation between the number of CVRF and the number of cardiovascular anomalies (r = 0.19, P < 0.001). With the exception of HbA1c, standard paraclinical tests were performed in less than 50% of patients. There was positive agreement between day-to-day HbA1c and HbA1c target values in 36% of patients.

Conclusion. – Complications and/or associated diseases were more frequent in this cohort of elderly diabetic patients compared with those in studies not based on clinical examinations. Our results highlight the inadequate management, given the frequent discrepancy between day-to-day HbA1c and HbA1c target values, of such patients.

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Résumé

Risques et prise en charge des diabétiques âgés en France.

Objectif. – Évaluer la situation diabétologique et gériatrique de patients diabétiques âgés, évaluer le lien entre le contrôle glycémique et les complications du diabète et comparer la prise en charge réelle de diabétiques âgés aux recommandations.

Méthodes. – Deux cent trente-huit diabétiques âgés ont été inclus. Les antécédents médicaux des six mois précédant l’examen clinique, les examens biologiques standard de surveillance et le fond d’œil ont été enregistrés.

Résultats. – L’âge moyen des patients était de 82.2 ± 7.2 ans. L’HbA1c était supérieure ou égale à 8,5 % chez 24 % des patients. Le nombre moyen de facteurs de risque cardiovasculaire (FRCV) était de 4,1 ± 0.7 par patient. Soixante-huit pour cent des patients avaient une démence ou une altération cognitive. Le débit de filtration glomérulaire estimé était inférieur ou égal à 30 ml/min chez 16 % des patients et 37 % des patients avaient une rétinopathie. Au cours des six mois précédant, 64 % des patients avaient eu une infection. Plus de la moitié des patients recevaient de l’insuline. Les prévalences de rétinopathie, d’altérations cognitives et d’infections étaient significativement moins fréquentes chez les patients ayant une HbA1c inférieure ou égale à 6,5 %. Il y avait une corrélation positive entre le nombre de FRCV et le nombre d’altérations cardiovasculaires (r = 0.19, P < 0.001). En dehors du dosage de l’HbA1c, les examens paracliniques standards de surveillance n’avaient été réalisés que chez moins de la moitié des patients. Il existait une concordance entre la valeur réelle d’HbA1c et l’objectif d’HbA1c chez 36 % des patients seulement.

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Mots clés : Diabète ; Vieillissement ; Complications ; Facteurs de risque cardiovasculaire ; Traitement

1. Introduction

In France, the largest group of treated diabetic patients is between 75 and 79 years of age (14%), and at least one million patients aged ≥65 years are diabetic. The high mortality of diabetes seen with age is mostly due to cardiovascular complications. Diabetes also leads to hospitalization and institutionalization, and diminishes quality of life [1].

The prevalence of complications in elderly diabetics and its relevance to glycaemic control has rarely been reported. This is because other associated diseases in such patients often interfere with the underlying pathology. Only a few French studies have specifically examined the management of older diabetics or analyzed the complications of diabetes in the elderly [2,3] but, even so, these reported studies either failed to include the results of the patients’ clinical examinations or only included a few parameters not specific to diabetes.

The aims of this study, based on clinical examination, were:

- to evaluate the diabetic and geriatric characteristics in older diabetic patients visiting or admitted to non-diabetic medical units;
- to evaluate the relationship between glycaemic control and complications of diabetes;
- to compare the day-to-day management of elderly diabetic patients with the published recommendations [4].

2. Patients and methods

This prospective observational study was carried out between October 2003 and May 2005 in diabetic patients, aged ≥70 years, being treated, or not, for their diabetes. These patients had visited or been admitted for the first time into one of two units of geriatric and internal medicine or one re-adaptation unit of a French University Hospital. Initially, 250 patients were included in the study. However, data were available for only 238 of these patients.

Initially, data regarding previous medical history, clinical examinations and standard biological tests were routinely recorded in a computerized database. These data included:

- demographic characteristics (age, gender, place of residence);
- geriatric characteristics (the activities of daily living [ADL] scale of autonomy, the Mini-Mental State Examination [MMSE] score of cognitive function and Charlson’s score of associated diseases);
- other cardiovascular risk factors;
- infectious and metabolic complications (hypoglycaemia, acidoketosis, hyperosmolar or hypoglycaemic coma) occurring in the past six months;
- the micro- and macrovascular complications of diabetes;
- results of clinical examination (weight, height, body mass index, arterial pressure, signs of coronary heart disease, cardiac failure, neurological impairment, absence of pulse in lower limbs, foot wounds and depression);
- fasting glycaemia, glycosylated haemoglobin (HbA1c) and serum creatinine during the previous month or during the study, with estimation of glomerular filtration rate (GFR) according to the Cockcroft–Gault formula;
- ocular fundus examination during the previous year or during the study;
- treatment (diet, oral antidiabetic drugs, insulin, patient’s and/or family’s knowledge of diabetes, modality of treatment administration and frequency of medical consultations).

We also collected the results of other biological and radiological tests performed during the previous six months, including:

- postprandial glycaemia;
- microalbuminuria or proteinuria;
- serum-cholesterol and LDL-cholesterol levels (but not plasma triglycerides);
- electrocardiography (ECG);
- retinal angiography;
- and arterial Doppler ultrasound of the lower limbs and supra-aortic arteries.

Finally, we asked each patient’s general practitioner (GP) what the therapeutic goal (fasting glycaemia and HbA1c) was and, when the HbA1c target was greater than 7%, what the rationale of this was.

Quantitative values are expressed as means ± standard deviation, and were compared by Student’s t test, while qualitative values were compared by the Khi-squared test. We used Spearman’s non-parametric test to evaluate the correlation between two quantitative variables, and $P<0.05$ was considered statistically significant.

3. Results

3.1. Demographic characteristics

A total of 74/238 patients (31%) were aged 85 years or older (maximum age: 102 years). The patients’ duration of diabetes ranged from a few months to 50 years. The ADL score was ≤4
Table 1
Study patients’ demographics, cardiovascular risk factors (excluding age and diabetes) and antidiabetic drug treatments (n = 238).

<table>
<thead>
<tr>
<th>Patients’ characteristics</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years, mean ± SD)</td>
<td>82.2 ± 7.2</td>
</tr>
<tr>
<td>Gender (women, %)</td>
<td>58.4</td>
</tr>
<tr>
<td>Duration of diabetes (years)</td>
<td>14.5 ± 12.4</td>
</tr>
<tr>
<td>Living at home with or without help</td>
<td>150 (63)</td>
</tr>
<tr>
<td>ADL (mean ± SD) out of 6</td>
<td>3.9 ± 1.7</td>
</tr>
<tr>
<td>Hypertension</td>
<td>186 (78)</td>
</tr>
<tr>
<td>Body mass index &gt; 25</td>
<td>145 (61)</td>
</tr>
<tr>
<td>Dyslipidaemia</td>
<td>83 (35)</td>
</tr>
<tr>
<td>Current smoker</td>
<td>37 (16)</td>
</tr>
<tr>
<td>Family history of coronary heart disease</td>
<td>33 (14)</td>
</tr>
<tr>
<td>Insulin</td>
<td>105 (44)</td>
</tr>
<tr>
<td>One or more oral antidiabetic drug</td>
<td>81 (34)</td>
</tr>
<tr>
<td>Insulin + oral antidiabetic drug</td>
<td>11 (5)</td>
</tr>
<tr>
<td>No antidiabetic drug</td>
<td>41 (17)</td>
</tr>
</tbody>
</table>

*Unless otherwise indicated; ADL: activities of daily living.

out of 6 in 120 patients (50%), and corresponded to functional dependency. Two-thirds of the patients lived at home, while the remainder lived in residential geriatric care centers or nursing homes (Table 1).

3.2. Cardiovascular risk factors

The mean number of cardiovascular risk factors was 4.1 ± 0.7 per patient, including diabetes and ageing. A total of 165 hypertensive diabetics (89%) were taking two or more anti-hypertensive drugs. Mean systolic blood pressure (BP) during the study was 139.2 ± 19.2 mmHg, and mean diastolic BP was 76.6 ± 12.4 mmHg. BP value was < 130/80 mmHg in 100 of our hypertensive diabetics (54%) (Table 1).

One lipid-lowering drug (a statin in 79% of cases) was prescribed for 67 diabetics with dyslipidaemia (81%). In the 68 patients with a recent lipid test (29%), mean total cholesterol was 5.2 ± 2 mmol/L (range 2.5–12.6 mmol/L) and mean LDL cholesterol was 3.0 ± 1.2 mmol/L; 68% of patients had an LDL cholesterol lesser than 3.4 mmol/L (1.3 g/L) and only 36% had an LDL cholesterol lesser than 2.58 mmol/L (1 g/L).

Only 21/238 patients (9%) had no cardiovascular risk factors other than ageing and diabetes, whereas 101 patients had one cardiovascular risk factor as well as ageing and diabetes, 70 had two further factors, 39 had three further factors and seven had four further factors.

3.3. Glycaemic control

Mean fasting glycaemia was 8.2 ± 3.3 mmol/L, and mean HbA1c was 7.6 ± 1.5% (range 4.7–13.2%). HbA1c value was between 7.5 and 8.5% in 54 patients (23%) (Fig. 1) and, in 60 patients (25%), the HbA1c was ≤ 6.5%; all these patients had a further cardiovascular risk factor other than diabetes and ageing. Table 2 shows the prevalence of acute metabolic complications in the six months prior to the study.

3.4. Cardiovascular assessment

One or more cardiovascular diseases were present in 162 patients (68%). However, only 65 patients (40%) were taking an antiplatelet drug for ischaemic cardiopathy, a history of stroke and/or peripheral arterial disease (often associated), and only 11/57 patients with atrial fibrillation were taking an oral anticoagulant drug. Twenty-eight patients (12%) had one or more foot wounds (Table 3).

3.5. Cognitive assessment

Mean MMSE score was 20.3 ± 7.5 out of a possible 30. A total of 94 patients (40%) had pre-existing dementia, and 68 (47%) of the remaining 144 patients had an MMSE score...
of ≤ 24/30, corresponding to cognitive impairment not diagnosed prior to entering the study. Thus, 68% of our patients had dementia or other cognitive dysfunction (Table 3).

3.6. Renal assessment

Urine dipstick testing revealed proteinuria in 115 patients (48%). Mean value of estimated GFR was 52.3 ± 22.7 mL/min: 122 patients (51%) had an estimated GFR of 30–60 mL/min; and 39 (16%) had an estimated GFR ≤ 30 mL/min.

3.7. Ocular assessment

Known diabetic retinopathy was present in 13 of 73 patients (18%) on inclusion to the study. However, a total of 87 patients (37%) subsequently developed the condition.

3.8. Other associated diseases

A total of 150 patients (63%) had one or more infections within the past six months. The main infections were bronchopulmonary (35%) and urinary (23%), but multiple infections were also observed (31%). Mean Charlson’s score was 9.4 ± 2.3 (diabetes added two points to the score).

3.9. Relationship between glycaemic control, other cardiovascular risk factors and complications

The 60 patients with HbA1c ≤ 6.5% and the 178 patients with HbA1c greater than 6.5% did not significantly differ in terms of duration of diabetes (mean value 14.5 years), number of associated cardiovascular risk factors (mean value 1.8 ± 0.9 versus 1.8 ± 1.0), number of cardiovascular complications (mean value 1.5 ± 1.1 versus 1.5 ± 1.1), prevalence of dementia (23 [39%] versus 71 [40%] patients), number of acute metabolic complications and mean estimated GFR (54.3 ± 25.4 versus 49.5 ± 21.4 mL/min), respectively. On the other hand, the prevalence of diabetic retinopathy (5 [8%] versus 82 [46%] patients, P < 0.001), MMSE alterations (29 [48%] versus 133 [75%] patients, P < 0.001) and infectious complications (29 [48%] versus 121 [68%] patients, P < 0.01) were significantly less frequently seen in patients with HbA1c ≤ 6.5%.

In addition, there was a positive correlation between the number of cardiovascular risk factors and the number of cardiovascular alterations (r = 0.19, P < 0.001). The 21 patients no cardiovascular risk factors other than diabetes and ageing had fewer (not statistically significant) cardiovascular changes than the 217 diabetics with one or more further cardiovascular risk factors (0.9 ± 1.0 versus 1.3 ± 1.0, respectively).

3.10. Treatment of diabetes

Altogether, 60 patients (25%) and 84 families (35%) reported that they had been “informed about diabetes”. Also, 49% of the patients did not know which of their prescribed drugs was being taken for their diabetes. Furthermore, 195 patients (82%) reported that they were “following a diabetic diet”, and 84 patients (35%) were on another diet that was mainly salt-free. However, 39 patients (20%) confessed to not following their prescribed diet (Table 1).

Insulin was the antidiabetic drug being taken by more than half the patients. Of these patients, 83 (79%) were not taking an oral antidiabetic drug (OAD), but injecting daily insulin instead, with 33 (31%) patients using long-acting insulin and 50 (48%) using intermediate-acting insulin. The insulin injection was administered by a nurse in most cases (75/105 patients, 72%) whereas, among the other patients, this was done by a member of the family (in 10/105 patients) or the patients themselves (in 20/105 patients). An injection pen was used by 75 (71%) of these patients.

Of the 81 patients treated with an OAD that was not insulin, 64 (79%) were taking only one OAD. This drug was usually an intermediate-acting sulphonylurea (49 patients), but biguanide was also prescribed in 22 cases. An alpha-glucosidase inhibitor (nine patients) or glinide (one patient) were less frequently prescribed.

3.11. Monitoring and follow-up of diabetes

Altogether, 151 patients (63%) had one or more daily capillary glycaemia tests, usually performed by a nurse (in 76% of the 151 patients). Only 17% of the patients did the capillary glycaemia tests themselves. The fasting glycaemia goal was 8.6 ± 3.6, and only 20 patients were being followed-up by a diabetologist.

3.12. Fasting glycaemia and HbA1c targets

GPs had stated a glycaemic target for 213/238 (90%) patients and an HbA1c goal for 179/238 (75%) patients. In general, GPs did not determine an HbA1c target if they had not performed the HbA1c test themselves. The fasting glycaemia goal was 7–9 mmol/L in 59% of patients and lesser than 7 mmol/L in 16% (Table 5).

There was agreement between the day-to-day HbA1c and the HbA1c target in only 65/179 (36%) patients. Among the rest of the patients, the day-to-day HbA1c was usually higher than the HbA1c target.

Table 4

<table>
<thead>
<tr>
<th>Medical examination</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venous postprandial glycaemia</td>
<td>32 (14)</td>
</tr>
<tr>
<td>Lipid &lt; 6 months</td>
<td>68 (29)</td>
</tr>
<tr>
<td>HbA1c &lt; 6 months</td>
<td>160 (67)</td>
</tr>
<tr>
<td>Proteinuria/24 h &lt; 6 months</td>
<td>31 (13)</td>
</tr>
<tr>
<td>Serum creatinine ± creatinine clearance &lt; 6 months</td>
<td>209 (88)</td>
</tr>
<tr>
<td>Electrocardiography &lt; 1 year</td>
<td>117 (49)</td>
</tr>
<tr>
<td>Ocular fundus &lt; 1 year</td>
<td>73 (31)</td>
</tr>
<tr>
<td>Arterial Doppler ultrasound of lower limbs &lt; 1 year</td>
<td>41 (17)</td>
</tr>
<tr>
<td>Carotid Doppler ultrasound &lt; 1 year</td>
<td>21 (9)</td>
</tr>
</tbody>
</table>
The main reasons given by GPs for setting an HbA1c goal greater than 7.5% (in 42 patients) were: the desire to not aggravate any pre-existing complications (41%); a limited life expectancy (19%); cognitive impairment (17%); prevention of hypoglycaemia (17%); and social isolation (7%).

4. Discussion

This prospective observational study, involving 238 elderly diabetic patients (the majority of whom were not followed-up by a diabetologist) and based on clinical examination, revealed three complementary findings:

- it confirmed a high rate of complications and/or associated diseases resulting in functional dependency;
- it highlighted the inadequate follow-up of such patients;
- it revealed a lack of proper therapeutic management, as revealed by the frequent lack of agreement between day-to-day HbA1c and the HbA1c goal.

In the present study, mean HbA1c was moderately increased (7.6 ± 1.5%), and only 23% of patients had an HbA1c between 7.5 and 8.5%. This was lower than the mean HbA1c in the Échantillon national témoin représentatif des personnes diabétiques (ENTRED) study, where more than 25% of diabetic patients aged ≥ 65 years had an HbA1c ≥ 8%, whatever their age [3].

The most common acute metabolic complication was hypoglycaemia—all types—except for severe episodes, which were seen less frequently. In previously reported series, the frequency of hypoglycaemia varied because of differences in age, type of drugs and modalities of follow-up [5]. Nevertheless, severe hypoglycaemia is seen two to four times more frequently in elderly diabetics treated with insulin than in those treated with sulphonylurea [6–9].

The two main cardiovascular risk factors associated with diabetes were hypertension and excess weight. A total of 78% of patients in the present study were hypertensive, compared with more than 50% of patients aged 65–74 years, and 71% of those greater than 85 years in the ENTRED study [3]. Also, a total of 61% of our patients were overweight, compared with 48% of diabetics aged 75–84 years and 27% of elderly diabetics aged greater than 85 in the ENTRED study [3]. Hypercholesterolaemia was a less commonly seen risk factor (in 35% of patients). However, lipid testing was performed in only 29% of the patients in our study.

Altogether, 68% of patients had one or more cardiovascular disease. Coronary heart disease was found more frequently (37%) on clinical examination among our study patients than in the ENTRED study (self-declared prevalence of coronary heart disease was 20% in those 65–74 years of age and 28% after age 85 years) [3]. In our study, 25% of patients had heart failure. Diabetes is usually considered an important risk factor for heart failure in the elderly, with a prevalence twice that of elderly non-diabetics [10–13]. The prevalence of coronary heart disease increases with age and with the duration of diabetes. Also, the high mortality rate in elderly diabetics is known to be related to cardiovascular disease [1,14,15]. We have also found a relationship between the number of cardiovascular risk factors and cardiovascular changes. Unfortunately, it is not possible to distinguish between the consequences of diabetes and those of other risk factors in elderly diabetics as several risk factors are frequently present in such patients at the same time.

In our study, 12% of patients had one or more foot wounds and 8% had a previous history of one or more amputations. In fact, ageing and diabetes increase the risk of amputation via several mechanisms (such as poor blood circulation, foot ulcers and neuropathy) [16–18]. Foot wounds, revealed on clinical examination, were more frequent in our cohort compared with that of the ENTRED study (6%), based on a patient’s questionnaire [3].

Dementia was present in 40% of our patients, and 47% of the remaining patients had cognitive impairment, which was only diagnosed during the study. In contrast, 24% had a history of stroke and 35% were depressed. Cerebral impairment in diabetics results from several frequently associated mechanisms, including hyperglycaemia, hypertension, stroke and depression. Several studies have reported a deleterious effect of chronic hyperglycaemia on cognitive function, leading to a twofold risk of vascular dementia [19–25]. Furthermore, diabetes increases the risk of ischaemic stroke fourfold – whatever the patient’s age [26,27]. In diabetics, there is a correlation between the main cardiovascular risk factors – in particular, hypertension – and cognitive impairment. Indeed, if hypertension goes untreated, then cognitive dysfunction is increased, leading to a six-fold increase in the risk of vascular dementia [28–30]. Previous studies have suggested that only 36% of patients greater than 70 years of age were not mentally impaired or depressed, whereas 21% of diabetics were found to be depressed in the Personnes agées Quid (PAQUID) study [2,31].

Proteinuria was present in 48% of patients, and 67% had an estimated creatinine clearance lesser than 60 mL/min. The prevalence of nephropathy in elderly diabetics remains a moot point because of the different methods of evaluation used in the various studies; also, non-diabetic nephropathy is often found in diabetics (particularly hypertensive nephropathy) [32,33]. Diabetic retinopathy was present in 37% of patients, including those with only a short duration of diabetes. Indeed, retinopathy has been reported in 25–30% of elderly diabetics with a disease duration of only five years [34–36]. The Eye Diseases Prevalence Research Group (EDPRG) study showed a prevalence of diabetic retinopathy of 44–46% in elderly diabetics aged 65–74 years, and of 38–46% in those aged ≥ 75 years [37]. Two previous studies showed a prevalence of diabetic retinopathy ranging from 8 to 14% in elderly diabetics diagnosed after age 70 [38,39].

### Table 5

Agreement between day-to-day HbA1c and HbA1c target values (n = 179).

<table>
<thead>
<tr>
<th>HbA1c actual</th>
<th>≤ 6.5%</th>
<th>&gt; 6.5% and &lt; 7.5%</th>
<th>≥ 7.5% and &lt; 8.5%</th>
<th>≥ 8.5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>HbA1c target</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>≤ 6.5%</td>
<td>20 (11)</td>
<td>5 (2)</td>
<td>0</td>
<td>8 (5)</td>
</tr>
<tr>
<td>&gt; 6.5% and &lt; 7.5%</td>
<td>18 (10)</td>
<td>36 (20)</td>
<td>30 (17)</td>
<td>20 (11)</td>
</tr>
<tr>
<td>≥ 7.5% and &lt; 8.5%</td>
<td>8 (5)</td>
<td>12 (7)</td>
<td>9 (5)</td>
<td>13 (7)</td>
</tr>
</tbody>
</table>

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J. Doucet et al. / Diabetes & Metabolism 34 (2008) 574–580
The prevalence of infections was statistically significant, with 63% of patients having had one or more infections in the six months prior to the study.

More than half of our drug-treated patients took insulin. In the ENTRED study, 64% of diabetics more than 65 years of age took sulphonylurea, and only 19% were taking insulin alone or combined with an OAD [3]. The difference between the results of these two studies may be explained by differences in patients’ age: the mean age of our study patients was higher and may have led to conditions with a greater need for insulin.

Our results show a high prevalence of complications and/or associated diseases, reflected by a high Charlson score, that frequently led to functional dependency (50% of the patients had an ADL score of ≤ 4 out of a possible 6). The increased risk of functional dependency in elderly diabetics is the result of the cumulative effects of ageing and diabetes [3]. It is generally accepted that diabetes duration increases with age [3], and our study strongly suggests that the influence of ageing was relatively more important than the effects of diabetes. In fact, 31% of patients were ≥ 85 years, and more than 23% of these patients had a duration of diabetes of less than five years.

Our study showed a relationship between glycaemic control and complications, cognitive changes and infectious complications. On the other hand, we found no relationship between glycaemic control and degenerative complications or acute metabolic complications. Several hypotheses might explain these results:

- a lack of information on parameters not routinely evaluated (such as proteinuria);
- only one relatively recent test of HbA1c was considered, which may not reflect long-term control of diabetes;
- only a small number of elderly diabetics had an HbA1c ≤ 6.5%;
- other cardiovascular risk factors may have interfered, as most of our patients had one or more risk factors in addition to age and diabetes;
- cardiovascular disease may have been present before diabetes in these elderly patients.

Our results confirm that the follow-up of diabetes as well as other cardiovascular risk factors was often inadequate in comparison to French and European recommendations [4,42]. HbA1c, for example, had been measured in only 67% of patients in the six months prior to the study. Except for the creatinine test, the main biological and radiological tests were performed in less than half the patients, a result similar to that previously reported by the ENTRED study [1].

Although elderly diabetics are at high risk for cardiovascular disease, complications of diabetes and associated disorders, it is well known that cardiovascular risk factors remain insufficiently treated in such patients [1]. HbA1c was ≥ 8.5% in 24% of patients, a level far too high even for frail, elderly diabetics [40]. Mean total-cholesterol and LDL-cholesterol levels were low: 68% had an LDL cholesterol lesser than 1.3 g/L, similar to the result found in the ENTRED study [3]. However, lipid testing was not routinely performed. This situation, commonly seen in elderly patients, was already highlighted by the ENTRED study, which found rates ranging from 45% in 65–74-year-old diabetics to 16% in those more than 85 years of age [3]. On the other hand, our results showed that hypertension was usually corrected as recommended [40–42]. Mean blood pressure was 139/76 mmHg, with 54% of the hypertensive patients having a blood pressure lesser than 130/80 mmHg.

Certain circumstances may have led GPs to follow recommendations less assiduously:

- previous recommendations were originally based on those for younger diabetics, although recent French recommendations, based on clinical trials, now suggest adapting the therapeutic goal to a given patient’s clinical status and frailty [43,44];
- it is difficult to examine patients with functional dependency or who fail to show up for consultations (such as eye tests);
- a lack of therapeutic benefit is assumed for patients with shorter life expectancies;
- it is difficult to interpret certain results (such as microalbuminuria).

On the other hand, the lack of follow-up may also be related to insufficient knowledge of the official recommendations by GPs, a lack of glycaemic targets set for healthy elderly patients with conserved life expectancy and/or underestimation of the consequences of hyperglycaemia on particular complications such as microangiopathy or infections [36,45].

In conclusion, this study of elderly diabetic patients showed a greater frequency of diabetes complications and/or associated diseases than have previous studies not based on clinical examinations. Our results highlight a lack of adequate therapeutic management, given the frequent discordance between day-to-day HbA1c and HbA1c targets, although differences in patient recruitment and geographical location impose limits on what can be extrapolated from the present study results. The study also suggests the persistent effect of glycaemic control and/or cardiovascular risk factors on certain complications. A follow-up study is warranted to detail the effects of hyperglycaemia and/or other cardiovascular risk factors to accurately estimate HbA1c targets and other goals in the treatment of cardiovascular risk factors in elderly diabetics.

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References
