Management of hypertension and screening of renal complications by GPs in diabetic type 2 patients (France — 2001)

F Fagnani¹, T Souchet², D Labed³, S Gaugris², T Hannedouche⁴, A Grimaldi⁵

SUMMARY

Background: Our aim was to assess the quality of the medical management by GPs of hypertension and renal insufficiency in type 2 diabetic patients.

Methods: A retrospective cohort study was run on a national random representative sample of 5,518 patients presenting with type 2 diabetes mellitus treated pharmacologically by a general practitioner from April 2000 to April 2001.

Results: Sixty percent of patients underwent a HbA1c measurement during the last 6 months and among them 27% exceeded the threshold of 8%. Glomerular Filtration Rate, calculated with the Cockcroft formula, was below 60 ml/min (confirmed renal failure) in 21.9% of patients and was in the 61-80 ml/min range (probable early renal insufficiency) in 27%. Proteinuria was documented in 30.1% of patients, 13.7% of whom were positive. Microalbuminuria was documented in 36%, 15% of whom were positive. Hypertension was treated pharmacologically in 59.6% of the sample (39.3% on monotherapy, 34.2% on double combination therapy and 26.5% on triple combination therapy or more). Blood pressure was >140 and/or 80 mmHg in 81.6% of treated patients and in 27% among untreated.

Conclusion: These findings suggest that significant progress still needs to be made in the care and treatment of type 2 diabetic patients, especially those with hypertension, in order to reduce or delay the incidence of renal and cardiovascular complications.

Key-words: Hypertension - Nephropathy - Type 2 Diabetes - France - Epidemiology.

La prise en charge de l’hypertension artérielle et le dépistage des complications rénales dans le diabète de type 2 en médecine générale (France — 2001)

Contextes : Le but de cette étude est d’évaluer la qualité de la prise en charge de l’hypertension artérielle et le suivi de la fonction rénale chez les patients diabétiques de type 2 en médecine générale.


Résultats : Environ 60 % des patients ont bénéficié d’un dosage de l’HbA1c, au cours des 6 derniers mois et celle-ci était > 8 % chez 27 % de ces patients. La fonction rénale de ces patients a été évaluée par la mesure du débit de filtration glomérulaire calculé selon la formule de Cockcroft. Parmi les patients, 21,9 % présentaient une insuffisance rénale avérée (< 60 ml/min) et 27 % une insuffisance rénale débutante probable (61-80 ml/min). La protéinurie était renseignée chez 30,1 % des patients et celle-ci était présente chez 13,7 % d’entre eux. La microalbuminurie était renseignée chez 36 % des patients et présente chez 15 % de ces derniers. Parmi les patients, 59,6 % étaient traités pharmacologiquement pour hypertension, dont 39,3 % en monothérapie, 34,2 % en bithérapie et 26,5 % en trithérapie ou plus. Malgré ces traitements, 81,6 % des patients traités avaient une pression artérielle > 140 et/ou 80 mmHg (27 % chez les non traités).

Conclusion : Des progrès substantiels dans la prise en charge, en particulier de l’hypertension artérielle, des patients diabétiques de type 2 doivent encore être réalisés afin de diminuer ou de retarder l’incidence des complications rénales et cardiovasculaires.

Mots-clés : Hypertension - Néphropathie - Diabète type 2 - France - Epidémiologie.

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The prevalence of type 2 diabetes is growing due to changes in lifestyle and longer life expectancies. It accounts for more than 90% of all diabetes mellitus. Diabetes leads to micro and macrovascular lesions and cardiovascular complications account for the major cause of mortality among diabetic patients. Cardiovascular morbidity and mortality increase by a two to three factor. Additionally, hypertension, frequently associated with diabetes, increases the risk of stroke. The combination of diabetes and hypertension multiplies by two the risk of stroke and death when compared to normotensive, non diabetic patients [1]. Renal complications, and notably diabetic nephropathy, account for approximately 30% of all new cases of end-stage renal disease [2]. Today, type 2 diabetes is the leading cause of dialysis in France [3] and in western countries [4, 5].

The monitoring of diabetic patients for complications, notably renal complications, is still inadequately documented in France and is the subject of growing attention among public health authorities [6].

This study was designed to estimate the prevalence of renal and cardiovascular complications among type 2 diabetic patients and to provide information on the quality of their management in primary care as it relates to hypertension treatment and renal function monitoring.

Material and methods

This retrospective cohort study was conducted in two phases among type 2 diabetic patients managed by the general practitioners from the MEDIPLUS panel (IMS-Health) from May 2000 to April 2001.

The MEDIPLUS panel

The MEDIPLUS panel is a computerised network of 650 general practitioners which is representative of the around 60,000 French general practitioners on the following criteria: gender, age, region of practice, and yearly activity.

At the end of each month, the physicians from the panel transfer electronically all their patient charts to a computing center, which enables to follow individual patient medical history over time. It should be noticed that physicians transfer to the network the information collected during patient’s office visits only.

The data collected for each visit are the following:

- an identification number guaranteeing patient anonymity but enabling patient tracking in the charts of each physician;
- patients date of birth and gender;
- patient office visit dates;
- prescribed medications, daily dosage and duration;
- diagnosis associated with each prescription;
- procedures prescribed and their results, when appropriate;
- any other prescriptions or services performed.

The volume of activity of each practitioner (number of consultations) is checked by comparing monthly data claims issued from Sickness Funds and the corresponding number of office visits. This type of checking is not possible for all parameters described above. For example, diagnostic/laboratory testing and their results are probably not reported systematically by the practitioners in the sample.

Data collection and analysis

Patients enrolled in the study were only those individuals who were pharmacologically treated for their type 2 diabetes. The first phase entailed direct analysis of data collected by the panel over the selected study period. Type 2 diabetic patients were identified in the database as being:

- patients with at least one oral antidiabetic prescription over the study period;
- patients with at least one diagnosis for type 2 diabetes reported by the physician associated with an insulin prescription.

During a second phase of this study, a questionnaire about the same patients was sent to each practitioner in order to collect retrospectively information not present into the database. For feasibility reasons, this survey was limited to a random sub-sample consisting of the half of the type 2 diabetic patients of phase 1 seen at least twice by the panel physicians over the observation period.

Results

Study population

The 650 general practitioners in the panel treated a group of 14,610 type 2 diabetic patients pharmacologically during the observation period, i.e. a mean number of 22 patients per physician.

Among these 14,610 patients, 12,512 patients visited their physician more than twice within the 12-month period prior to April 2001. In the phase 2 of the study, the patient sample was reduced to 6,260 randomly selected individuals. The questionnaire response rate was 88%, i.e. 5,518 questionnaires were received. Among them, 29 concerned patients deceased during the study period and 11 files were eliminated as improper to be used in the analysis. Overall, 5,478 questionnaires were then analyzed.

Prevalence of type 2 diabetes

The extrapolated number of type 2 diabetic patients in general practice estimated from the panel data was 1,361,600, i.e. a prevalence of 2.3% when related to the general population (1999 population census, INSEE). The yearly median number of general practice office visits was 5.

The diabetic patient sample contained 57.9% males versus 42.1% females. The 60 to 79 year old group had the highest prevalence of type 2 diabetes.
number of patients with respectively 59.1% of the males and 
56.8% of the females. Over 60 years of age, 69.5% of the 
patients were male and 62.7% were female (Fig 1).

Among the type 2 diabetic patients, the diagnosis had 
been established for at least 10 years for 61.7% of them. The 
median time since diagnosis of diabetes was 8 years.

**Prevalence and incidence of cardiovascular**

The prevalence and yearly incidence of major cardiovas-
cular complications (stroke and/or transient ischemic attack, 
peripheral arterial disease, angina pectoris, myocardial inf-
arction, heart failure, and cardiac rythm disorders) in this 
population are listed in Table I. Nearly 30% of the patients 
suffered at least from one of these cardiovascular complica-
tions. Yearly incidence was estimated on the basis of the 
reported dates of occurrence of the complications specified 
by the physicians based on patient charts.

**Glycemic control**

Fasting glucose was reported at least once for 96.5% and 
HbA1c for 94.1% of patients in the sample. Among the dia-
betic patients whose plasma glucose was documented, 66.9% 
had a level higher than 1.26 g/l. It was noted that glycemia 
was measured in 68.6% of the patients during the previous 
year and HbA1c measurement was performed in 60.5% of 
patients within the last 6 months.

Among diabetic patients whose HbA1c was reported, 
only 31% had a level less than or equal to 6.5% and 27.5% had 
a level above 8%. It has to be noticed that these tests were not 
centralized (Fig 2).

**Table I**

Prevalence and annual incidence of cardiovascular complications.

<table>
<thead>
<tr>
<th>Cardiovascular complication</th>
<th>Prevalence (%)</th>
<th>Incidence for 1,000 Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke and/or TIA*</td>
<td>5.5</td>
<td>9.9</td>
</tr>
<tr>
<td>Peripheral arterial disease</td>
<td>9.3</td>
<td>7.5</td>
</tr>
<tr>
<td>Angina</td>
<td>11.2</td>
<td>10.6</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>5.2</td>
<td>5.4</td>
</tr>
<tr>
<td>Heart failure</td>
<td>5.3</td>
<td>6.1</td>
</tr>
<tr>
<td>Cardiac rythm disorders</td>
<td>3.12</td>
<td>3.2</td>
</tr>
</tbody>
</table>

*Transient Ischemic Attack.

Figure 1: Distribution by age and gender of type 2 diabetic patients treated pharmacologi-
cally.

Figure 2: Distribution of diabetic patients according to HbA1c values.
Blood pressure control antihypertensive therapy

Among the studied population, 59.6% of the patients received an antihypertensive medication. When fixed combinations were considered as containing 2 distinctive antihypertensive drugs, 39.3% of treated patients were on antihypertensive monotherapy, 34.2% of the patients were taking 2 antihypertensive drugs, and 23.5% were taking 3 or more. ACE-inhibitors were the most frequently prescribed drugs (50.7% of patients) (Tab IV). Among these patients treated for hypertension, 76.6% had documented blood pressure measurements and 81.6% of them had blood pressure >140/80 mmHg despite therapy (Tab II).

All patients treated for hypertension with documented blood pressure were classified into 4 groups according to the systolic blood pressure (SBP) and diastolic blood pressure (DBP) values (Tab III). Patients with SBP >140 mmHg and DBP < 80 mmHg (isolated systolic blood pressure) represented 31.8% and had the highest mean age. Patients with SBP >140 mmHg and DBP>80 mmHg represented 36.6%. Among these latter, 29.6% had a SBP >160 mmHg and a DBP>95 mmHg. Time since diagnosis of diabetes did not seem to influence blood pressure control.

Renal function monitoring

Prevalence of renal insufficiency

Out of our sample of 5,478 patients, 93.4% had a serum creatinine measurement prescribed and in 69.1%, the test had been performed within the last 12 months. Glomerular Filtration Rate (GFR) was estimated from the Cockcroft formula. It appeared than 21.9% of treated type 2 diabetic patients had patent renal insufficiency (GFR < 60ml/min) and 27.0% had a probable mild renal insufficiency (GFR: 61 - 80 ml/min) (Fig 3). Patients with GFR < 60 ml/min had a significantly higher mean age that those with a GFR >60ml/ min (74.5 versus 61.2 years) and a longer history of diabetes (12.0 versus 8.3 years).

Proteinuria and micro-albuminuria

It should be first noted that 65.5% of the patients did not have a proteinuria or a micro-albuminuria measurement. However, 81% of the panel physicians prescribed micro-albuminuria and/or proteinuria tests in at least one of their diabetic patients.

Proteinuria

Proteinuria was defined in this study as a proteinuria greater than or equal to 300 mg/24 hours or by a positive dipstick analysis. Only 30.1% of study patients had a proteinuria test documented in their medical chart (18.3% during the last year). Among the group of patients in whom proteinuria was documented, it was present in 13.7%.

We investigated whether the patients who had a proteinuria determination were different from those that did not have one, based on characteristics likely to influence the prescription of this test, i.e. age, time since diagnosis of diabetes, history of cardiovascular complication, GFR, antihypertensive treatment. There appeared to be no significant differences, aside from a tendency to treat hypertension more frequently in patients with a proteinuria determination.

Table II

Type 2 diabetic patients and hypertension (HTN).

<table>
<thead>
<tr>
<th>Patients treated for HTN</th>
<th>Patients untreated for HTN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 2 diabetic patients</td>
<td>8,706 (59.6%)</td>
</tr>
<tr>
<td>With reported BP*</td>
<td>6,668 (76.6%)</td>
</tr>
<tr>
<td>With SBP &gt; 140 mmHg</td>
<td>5,440 (81.6%)</td>
</tr>
<tr>
<td>Or DBP &gt; 80 mmHg</td>
<td>5,901 (40.4%)</td>
</tr>
<tr>
<td></td>
<td>2,608 (44.2%)</td>
</tr>
<tr>
<td></td>
<td>704 (27%)</td>
</tr>
</tbody>
</table>

*Blood pressure is the mean established from the values reported for the last 3 office visits.

Table III

Distribution of patients treated for hypertension according to blood pressure levels.

<table>
<thead>
<tr>
<th>SBP &lt; 140 mmHg</th>
<th>DBP &lt; 80 mmHg</th>
<th>DBP &gt; 80 mmHg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age: 67.0 (10.1)</td>
<td>Age: 62.0 (10.2)</td>
<td>Time since diagnosis: 9.3 (7.9)</td>
</tr>
<tr>
<td>Time since diagnosis: 9.3 (7.9)</td>
<td>Time since diagnosis: 8.0 (7.7)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SBP &gt; 140 mmHg</th>
<th>DBP &lt; 80 mmHg</th>
<th>DBP &gt; 80 mmHg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age: 68.2 (10)</td>
<td>Age: 65.5 (10.5)</td>
<td>Time since diagnosis: 10.3 (8.4)</td>
</tr>
<tr>
<td>Time since diagnosis: 10.3 (8.4)</td>
<td>Time since diagnosis: 10.3 (8.6)</td>
<td></td>
</tr>
</tbody>
</table>

*Numbers into brackets are SD.
tion. Subsequently, the prevalence of proteinuria in the type 2 diabetic population may be estimated at 13.7%.

Micro-albuminuria

Only 36% of the patients had a documented micro-albuminuria measurement (23% within the last 12 months). Among these patients, 15.1% had a positive result (> 30 mg/24 hours).

Here too, we checked whether the patients who had a micro-albuminuria measurement were different from those who did not have one, based on the same characteristics as above described. Once again, we found no significant difference, aside from a tendency to prescribe an antihypertensive drug more frequently in patients with a micro-albuminuria measurement.

Discussion

This study, carried out in general practice, provides an estimate of the prevalence of type 2 diabetes and its complications, to the extent that nearly all French diagnosed type 2 diabetic patients are regularly followed up by general practitioners [6]. It should, however, be noticed that this study was restricted to patients treated pharmacologically. The results confirmed the high prevalence of cardiovascular complications in type 2 diabetes. The values observed in this study were comparable to those reported in the literature [6-9]. This study enabled to determine the yearly incidence of cardiovascular complications. These incidences ranged from 0.3% for cardiac rhythm disorders to approximately 1% for angina pectoris. It should be noted that for complications associated with a significant mortality rate at the time of their occurrence (notably myocardial infarction and stroke), the figure should be increased by 10 to 20% to reflect this early mortality.

This study also enabled to evaluate the prevalence of renal insufficiency estimated by the GFR calculated by the Cockcroft’s formula. Similar data in the literature are based on serum creatinin values, which assess very inaccurately the level of renal function. Diabetes is not the single cause of the renal insufficiency since aging and other factors can contribute to renal impairment. Therefore, from a practical perspective, we chose to classify the patients according to their glomerular filtration rate irrespectively of their age. In fact, aside from its impact on morbidity and mortality, renal dysfunction has practical implications that need to be taken into account, for example, for dosage adjustment and monitoring of many drugs, and to avoid the prescription of nephrotoxic drugs (iodine, NSAIDS, etc). Our study showed that 2 out of 10 diabetic patients had patent renal insufficiency (GFR <60 ml/min) and that 3 out of 10 additional patients had probable renal impairment (GFR: 61-80 ml/min).

The prevalences of proteinuria (13.7%) and micro-albuminuria (15.1%) observed in this study were also high. These results are consistent with the high prevalence of renal dysfunction but are higher than the prevalences reported in a study conducted in 1997 in general practice where they were estimated approximately at 10% [2]. Nevertheless, one cannot exclude that the prevalence of proteinuria might be even higher due to the prescription of antihypertensive drugs acting on the renin-angiotensin system (ACE-inhibitors, angiotensin II antagonists) and known to reduce proteinuria.

Glycemic control is still inadequately performed in France. Despite French current guidelines [15] (HbA1c monitoring every 3 to 4 months), only 60% of patients underwent HbA1c testing over the last 6 months. This figure is consistent with the one reported by the CNAMTS (French National Health Insurance) in 2000 [6], since 60.6% of patients had been reimbursed for 1 to 3 HbA1c assays over the last 6 months. But this study involved type 1 diabetic patients as well. Our study also confirmed that nearly 70% of type 2 diabetic patients did not achieve the French recommended therapeutic objective (HbA1c ≤ 6.5%) and that the glycated hemoglobin was over 8% in 27% of patients. This data
showed that significant improvement can still be made in the glycemic monitoring and control of type 2 diabetic patients. The prevalence of hypertension (79.5%) is high among diabetic patients. The proportion of patients treated for hypertension (59.6%) is comparable to that reported in the literature [1]. It should, however, be noticed that over 80% of patients treated for hypertension had blood pressure above the recommended treatment goal (140/80 mmHg) [11]. Similarly, nearly 3 out of 10 patients not receiving hypertensive therapy had a blood pressure over 140/80 mmHg. Subsequently, overall, 99% of diabetic patients treated as well as untreated for hypertension, had blood pressure over 140/80 mmHg, i.e. approximately 810,000 individuals in France. It has to be noticed here that clinical guidelines concerning patients presenting simultaneously with hypertension and renal insufficiency recommend target values of 130/85 mmHg and even 125/75 mmHg when proteinuria is over 1 g/24h [16]. These considerations suggest that our results are still underestimated in terms of proportion of patients not at goals.

Although reduction of cardiovascular morbidity and mortality by a blood pressure control in diabetic patients has been demonstrated [10] further reduction could be obtained with an even more rigorous blood pressure control [17].

The inadequacy of blood pressure control was explained for a large part by the under-treatment of hypertensive patients since one patient out of two, on average, took only one antihypertensive medication (fixed combinations included). This observation takes on even greater importance given that the combination of diabetes and hypertension multiplies the risk of stroke, cardiovascular events and death compared to the normotensive, non diabetic patient. It also increases significantly the risk of retinopathy [11]. Similarly, in presence of proteinuria and inadequately controlled hypertension, the mean time of progression from proteinuria to end-stage renal disease is 6 years [12, 13]. This finding contributes to explain why type 2 diabetes is, today in France, the primary cause of dialysis [2], accounting for up to 40% of all new dialysis patients in Alsace [14].

Proteinuria screening in type 2 diabetic patients continues to be very insufficient. Less than 2 patients out of 10 have undergone proteinuria testing over the last 12 months. This screening is of particular importance since several prospective studies have shown that the level of proteinuria is closely related to the rate of renal failure progression [18]. Early recognition of renal changes would increase the chance to prevent the progression from incipient to overt nephropathy [19]. Proteinuria should be reduced as far as possible, although no clinical studies have been performed to define the level of proteinuria below which renal function would remain stable. Reduction of proteinuria by inhibiting the renin-angiotensin system has been shown for a long time, and recently the superiority of blocking the renin-angiotensin system in slowing down progression to end-stage renal disease in type 2 diabetic patients has been established [13, 20].

In contrast, renal function was better monitored because nearly 70% of all patients underwent a serum creatinine measurement over the last 12 months.

Despite the progress achieved recently in France in the management of type 2 diabetic patients, notably due to the intensive efforts made by French National Health Insurance, the study showed that the Guidelines are still very insufficiently implemented. Substantial progress in the management of type 2 diabetic patients ought to be made in order to better prevent renal and cardiovascular complications.

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References