Prevalence of Chronic Kidney Disease and Blood Pressure Control Status in Elderly Hypertensive Patients

Eri Hasegawa, Takuya Tsuchihashi and Yuko Ohta

Abstract

Objective Hypertension guidelines recommend strict blood pressure (BP) control to less than 130/80 mmHg in patients complicated with chronic kidney disease (CKD). However, it is unclear whether this target BP level is applicable to the elderly hypertensive patients. The aim of this study was to assess the prevalence of CKD and BP control status in elderly hypertensive patients.

Methods Subjects were 675 hypertensive patients (65.5±11.7 years, 290 males and 385 females). Prevalence of CKD and BP control status were compared between elderly and young/middle-age patients.

Results Average BP of elderly and young/middle-age patients were 134±10/71±9 mmHg and 131±11/78±9 mmHg, respectively. CKD was more prevalent in the elderly than in the young/middle-age patients (35.5% and 24.5%, respectively). The elderly patients with CKD were more likely to be males and older. They also required a greater number of antihypertensive drugs than those without CKD (2.4±1.2 vs. 2.0±1.1, p<0.01). Elderly patients without CKD who achieved a target BP of <140/90 mmHg were 73.2%. Similarly, 78.5% of the patients with CKD achieved BP of <140/90 mmHg, while those who achieved <130/80 mmHg were only 29.6%.

Conclusion Our results suggest that CKD is frequently complicated in elderly hypertensive patients, and many of them failed to achieve strict BP goal in spite of the average use of 2.4 antihypertensive drugs.

Key words: chronic kidney disease, blood pressure, elderly, antihypertensive drugs

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Introduction

Renal function declines with age and the prevalence of chronic kidney disease (CKD) in the elderly (over than 60 years) is reported to be 24% in Japan (1). It is well known that CKD is more prevalent in hypertensive patients and large-scale clinical trials have shown that strict blood pressure control is important to prevent the progression of renal damage (2, 3). Based on these findings, guideline for the management of hypertension in the Japanese Society of Hypertension (JSH 2009) recommends the target BP <130/80 mmHg for the patients with CKD, and <125/75 mmHg for those with proteinuria ≥1 g/day (4). However, there are very few studies with evidence on the target BP in the elderly hypertensive patients with CKD, and thus it remains unclear whether strict BP control is warranted in elderly subjects. In the present study, we assessed the prevalence of CKD and BP control status in elderly hypertensive patients.

Materials and Methods

Subjects were 675 treated hypertensive outpatients (65.5±11.7 years, 290 males and 385 females) who visited the National Kyushu Medical Center, Japan. Clinic BP was measured by a sphygmomanometer in the sitting position. Body height and weight were measured and the body mass index (BMI) was calculated. Total cholesterol, triglycerides, HDL-cholesterol, serum creatinine, serum uric acid, and HbA1c were determined. Urinalysis was also performed to detect proteinuria. Estimated glomerular filtration rate (eGFR) was calculated using the revised form of the Modification of Diet in Renal Disease (MDRD) equation for Japanese (5). Patients with CKD were defined as follows: CKD stage 1:
Table 1. Characteristics of the Subjects

<table>
<thead>
<tr>
<th></th>
<th>all</th>
<th>young/middle-age</th>
<th>elderly</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>675</td>
<td>294</td>
<td>381</td>
</tr>
<tr>
<td>Female (%)</td>
<td>57</td>
<td>52</td>
<td>61*</td>
</tr>
<tr>
<td>Age (years)</td>
<td>65.5±11.7</td>
<td>54.5±7.9</td>
<td>73.8±5.9**</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>24.0±3.4</td>
<td>24.4±3.5</td>
<td>23.7±3.3**</td>
</tr>
<tr>
<td>Systolic blood pressure (mmHg)</td>
<td>133±11</td>
<td>131±11</td>
<td>134±10**</td>
</tr>
<tr>
<td>Diastolic blood pressure (mmHg)</td>
<td>74±10</td>
<td>78±9</td>
<td>71±9**</td>
</tr>
<tr>
<td>Number of antihypertensive drugs</td>
<td>2.1±1.0</td>
<td>2.1±1.0</td>
<td>2.2±1.1</td>
</tr>
<tr>
<td>Total cholesterol (mg/dL)</td>
<td>205±31</td>
<td>209±32</td>
<td>202±30**</td>
</tr>
<tr>
<td>Triglyceride (mg/dL)</td>
<td>136±85</td>
<td>152±102</td>
<td>123±67**</td>
</tr>
<tr>
<td>HDL cholesterol (mg/dL)</td>
<td>58±14</td>
<td>58±14</td>
<td>58±14</td>
</tr>
<tr>
<td>Creatinine (mg/dL)</td>
<td>0.82±0.45</td>
<td>0.81±0.50</td>
<td>0.84±0.40</td>
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<tr>
<td>eGFR (mL/min/1.73m²)</td>
<td>69.6±20.3</td>
<td>75.5±20.4</td>
<td>65.0±18.9**</td>
</tr>
<tr>
<td>Uric acid (mg/dL)</td>
<td>5.47±1.39</td>
<td>5.56±1.41</td>
<td>5.40±1.37</td>
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<tr>
<td>HbA1c (%)</td>
<td>5.53±0.67</td>
<td>5.55±0.74</td>
<td>5.52±0.61</td>
</tr>
<tr>
<td>Diabetes mellitus (%)</td>
<td>17.9</td>
<td>18.0</td>
<td>17.9</td>
</tr>
</tbody>
</table>

Mean±SD  
*p<0.05, **p<0.01 vs. young/middle-age

Figure 1. Relationship between age and estimated glomerular filtration rate (eGFR)

eGFR ≥ 90 mL/min/1.73m² with proteinuria, stage 2: 60 ≤ eGFR < 90 mL/min/1.73m² with proteinuria, stage 3: 30 ≤ eGFR < 60 mL/min/1.73m², stage 4: 15 ≤ eGFR < 30 mL/min/1.73m², stage 5: eGFR < 15 mL/min/1.73m². The presence of diabetes was defined as fasting serum glucose ≥ 126 mg/dL, serum glucose at any time ≥ 200 mg/dL, HbA1c ≥ 6.5%, or the use of hypoglycemic agents.

Statistical analysis

Results are presented as the mean ± SD. The differences in the variables were compared by one-way ANOVA. Categorical data were analyzed using the χ²-test. P values less than 0.05 were considered statistically significant.

Results

Characteristics of the 675 patients are shown in Table 1. All patients were under antihypertensive therapy and the average number of drugs was 2.1. The elderly patients (65 years or older) were more likely to be females. Systolic BP was significantly higher and diastolic BP was significantly lower in the elderly than in the young/middle-age patients (134±10/71±9 mmHg and 131±11/78±9 mmHg, respectively). BMI, total cholesterol, triglycerides, eGFR were also significantly lower in the elderly patients.

As shown in Fig. 1, there was a significant negative correlation between age and eGFR (r=-0.39, p<0.01). The prevalence of CKD according to the age category is shown in Fig. 2. CKD was more frequently found in the elderly patients compared to that in young/middle-age patients (35.5% vs 24.5%). In both age groups, most of the patients with CKD belonged to stage 3.

Table 2 shows the comparison of the characteristics between elderly patients with and without CKD. Patients with CKD were older and more likely to be males. Although BP levels were comparable between the groups, the patients
with CKD needed more antihypertensive drugs than those without CKD (2.4±1.2 vs. 2.0±1.1, p<0.01).

The distribution of systolic and diastolic BP levels in the patients with and without CKD is shown in Fig. 3. The elderly patients without CKD who achieved target BP of <140/90 mmHg were 73.2%. On the other hand, the patients with CKD who achieved BP of <140/90 mmHg were 78.5%, while those who achieved target BP for CKD (<130/80 mmHg) were only 29.6% (Fig. 3A). There were no significant differences in eGFR levels among the elderly patients with BP levels of ≥140/90 mmHg, 130-139/80-89 mmHg and <130/80 mmHg (66.1±17.8, 65.6±20.6, 62.6±17.8 mL/min/1.73m², respectively). BP control status in the young/middle-age patients with CKD was similar to the elderly patients (Fig. 3B).

Comparison of hypertensive drugs between patients with and without CKD is shown in Fig. 4. Calcium channel blockers (CCB) were used in about 80% of the elderly patients with and without CKD (Fig. 4A). On the other hand, angiotensin II receptor blockers (ARB), angiotensin-converting enzyme (ACE) inhibitors and diuretics were more frequently used in patients with CKD. Patients who needed more than 3 antihypertensive drugs were 38.6% and 27.6% in the patients with and without CKD, respectively. In the young/middle-age patients, ARB, ACE inhibitors, β blockers and α blockers were more frequently prescribed to those with CKD (Fig. 4B).

**Discussion**

CKD is frequently complicated in the elderly hypertensive patients. In the present patients, 35.5% of elderly patients were CKD. Although hypertension guideline recommends strict BP control to less than 130/80 mmHg in the patients complicated with CKD, our patients who achieved target BP were only 29.6%.

Large-scale clinical trials have shown the usefulness of strict BP control for renal protection. Patients-level meta-analysis of 11 randomized, controlled trials showed that control of systolic BP 110 to 129 mmHg delays the progres-
sion of renal failure (3). In the case of patients with proteinuria ≥1 g/day, BP goal was recommended to be less than 125/75 mmHg (2). However, these studies did not include elderly subjects. Many studies such as RENAAL study (6)
which showed the usefulness of strict BP control for renal protection were directed for patients up to 70 years old. Even in MARVAL study (7), subjects up to 75 years old were enrolled. Therefore, it is not certain whether a target BP of <130/80 mmHg is also warranted for elderly patients. Based on the evidence that BP control reduces CVD risk in elderly patients, JSH2009 recommends BP goals for elderly patients to be less than 140/90 mmHg. Recently, HYVET study (8) showed the usefulness of BP reduction in the patients with 80 years or older. However, J curve phenomenon was also suggested in several trials (9, 10). Therefore, in elderly patients, BP goals should be set individually by considering the complications and organ damage of the patients, and BP should be reduced slowly and carefully. The present observation that only 29.6% of the elderly patients with CKD achieved target BP of <130/80 mmHg may reflect the doctors’ concern about the potential harmful influence induced by aggressive BP lowering therapy.

With regard to the use of antihypertensive drugs, JSH 2009 recommends that elderly hypertensive patients with CKD should be treated with renin angiotensin system (RAS) inhibitors, and subsequently combination therapy with CCBs or diuretics should be considered. There are many studies showing the renoprotective and antiproteinuric effects of RAS inhibitors. RAS inhibitors are also known to improve insulin resistance. Thus, elderly patients with CKD should be treated with RAS inhibitors unless specific contraindications such as bilateral renal artery stenosis exist. In the present elderly patients, ARB and ACE inhibitors were more frequently used in those with CKD indicating the doctors’ adherence to the guidelines. On the other hand, CCBs are often used in elderly patients and are necessary to achieve strict BP goal. Indeed, CCBs were most frequency used (about 80%) in the present patients. It should be noted that some CCBs have been shown to reduce proteinuria in CKD patients (11-13), and are suitable to use for those patients.

Diuretics are expected to lead sufficient BP reduction especially by using with RAS inhibitors. The prescription of diuretics has been low in Japan mainly due to their metabolic side effects such as hypokalemia, hyperuricemia and glucose intolerance. However, it has been shown that low dose diuretics can exhibit sufficient blood pressure reduction without prominent adverse effects (14). Additionally, ALLHAT, HYVET, SHEP studies showed the usefulness of diuretics in elderly patients (8, 15, 16). Although diuretics were more frequently used in the elderly patients with CKD than in those without CKD or young/middle-age patients, those taking diuretics were still less than 20%. Considering that the salt intake of Japanese remains high, diuretics may be more aggressively included in the combination therapy to achieve strict BP control. Fixed-dose combination tablets of ARB and diuretics became available, which will contribute to improve medication adherence.

A limitation of the present study is that the subjects were hypertensive patients who were treated at a hypertension clinic. Thus, our observations on the prevalence of CKD and BP control status may not be applicable to the general population or to the patients treated by general practitioners.

In conclusion, CKD is frequently complicated in Japanese elderly hypertensive patients, and it is difficult to achieve strict BP goal advocated by the guidelines. Since there is very little evidence on the target BP in elderly hypertensive patients with CKD, slow and careful BP reduction should be warranted.

The authors state that they have no Conflict of Interest (COI).

References

15. The ALLHAT Officers and Coordinators for the ALLHAT Collaborative Research Group. Major outcomes in high-risk hyperten-