Clustering of Cardiovascular Risk Factors and Blood Pressure Control Status in Hypertensive Patients

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Abstract

Objective  Hypertensive patients have multiple risk factors such as chronic kidney disease (CKD) and hyperuricemia in addition to components of metabolic syndrome. The morbidity of cardiovascular diseases is expected to increase synergistically by clustering of them. In the present study, we assessed the clustering of cardiovascular risk factors and blood pressure (BP) control status in hypertensive patients.

Methods and Patients  Subjects were 699 treated hypertensive patients (mean age: 65 ± 12 years; males 297, females 402) who had been followed at National Kyushu Medical Center, Fukuoka, Japan. We assessed the status of BP control and the presence of comorbidity including obesity, diabetes mellitus (DM), dyslipidemia, CKD and hyperuricemia.

Results  Average BP level and the number of antihypertensive drugs were 133 ± 11/74 ± 10 mmHg and 2.0 ± 1.1, respectively and the average number of cardiovascular risk factors was 1.5 ± 1.1. No comorbid risk factors were found in 18.7% of the patients. On the other hand, 34.2%, 28.9% and 18.2% of the patients had one, two or more than three risk factors, respectively. There were no significant differences in BP among these groups, while patients with three or more risk factors needed a greater number of antihypertensive drugs than those with other groups. Patients with three or more risk factors group showed significantly higher body mass index, serum LDL cholesterol, triglyceride, plasma glucose and serum uric acid levels compared to those with other groups (p<0.05, respectively). They also showed significantly lower serum HDL cholesterol and estimated GFR levels compared to those in other groups (p<0.05, respectively).

Conclusion  These results suggest that the majority of the treated hypertensive patients are complicated with additional cardiovascular risk factors and the patients with clustering risk factors required a greater number of antihypertensive drugs. Integrative management of BP as well as comorbid risk factors should be encouraged.

Key words: blood pressure control, hypertensive patients, clustering of cardiovascular risk factors

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Subjects included 699 patients, 402 females and 297 males, mean age 65 ± 12 years. BP was measured with a sphygmomanometer with the patient seated. BP control status was assessed based on the average clinic BP of two clinical visits. “Good control” was defined as systolic BP of <140 mmHg and diastolic BP (DBP) of <90 mmHg. “Satisfactory control” was defined as SBP of <130 mmHg and DBP of <85 mmHg. In addition, we assessed “Good control” was defined as systolic BP of <130 mmHg and diastolic BP (DBP) of <85 mmHg. "Satisfactory control” was defined as SBP of <130 mmHg and DBP of <85 mmHg. “Good control” was defined as systolic BP of <140 mmHg and diastolic BP (DBP) of <90 mmHg. “Satisfactory control’’ was defined as SBP of <130 mmHg and DBP of <85 mmHg. “Good control” was defined as systolic BP of <140 mmHg and diastolic BP (DBP) of <90 mmHg. "Satisfactory control’’ was defined as SBP of <130 mmHg and DBP of <85 mmHg. “Good control” was defined as systolic BP of <140 mmHg and diastolic BP (DBP) of <90 mmHg. "Satisfactory control’’ was defined as SBP of <130 mmHg and DBP of <85 mmHg.

Number of antihypertensive drugs

Serum LDL cholesterol (mg/dL)

Serum triglyceride (mg/dL)

e GFR (mL/min/1.73m²)

diabetes mellitus, dyslipidemia, chronic kidney disease, hyperuricemia.

Risk factor: obesity, diabetes mellitus, dyslipidemia, chronic kidney disease, hyperuricemia

Methods

Subjects were treated hypertensive patients who had been followed at National Kyushu Medical Center, Fukuoka, Japan. Subjects included 699 patients, 402 females and 297 males, mean age 65 ± 12 years. BP was measured with a sphygmomanometer with the patient seated. BP control status was assessed based on the average clinic BP of two clinical visits. “Good control” was defined as systolic BP (SBP) of <140 mmHg and diastolic BP (DBP) of <90 mmHg. “Satisfactory control” was defined as SBP of <130 mmHg and DBP of <85 mmHg. In addition, we assessed the presence of obesity, diabetes mellitus (DM), dyslipidemia, CKD and hyperuricemia.

Body mass index (BMI) was calculated as weight/height² (kg/m²). Obesity was defined ≥25 kg/m². DM was defined as fasting serum glucose ≥126 mg/dL, serum glucose ≥ 200 mg/dL at any time, HbA1c ≥6.5%, or the current use of hypoglycemic agents. Dyslipidemia was defined as serum LDL cholesterol ≥140 mg/dL and/or serum HDL cholesterol <40 mg/dL or the current use of lipid lowering drugs. Hyperuricemia was defined as serum uric acid ≥7 mg/dL or the current use of antihyperuricemic drugs. CKD was considered to be present if the patient had either a decreased estimated glomerular filtration ratio (eGFR) (<60 ml/min) or persistent proteinuria. eGFR was calculated using the Modification of Diet in Renal Disease (MDRD) formula (for men, 0.741×175×serum creatinine levels⁻¹.15×age⁻₀.20; for women, 0.741×175×serum creatinine levels⁻¹.15×age⁻₀.21×0.742).

This study was conducted following the guidelines of the National Kyushu Medical Center.

Statistical analysis

Values are presented as the mean ± standard deviation (SD). The differences in the variables were compared by one-way ANOVA followed by a Scheffe’s multiple comparison test if necessary. A chi-square test was also utilized when appropriate. P values of less than 0.05 were considered significant.

Results

Subjects characteristics are presented in Table 1. Mean age was 65 ± 12 years, and 57.5% of the patients were female. Mean value of BMI was 24 ± 3 kg/m². Average BP level and the number of antihypertensive drugs were 133 ± 11/74 ± 10 mmHg and 2.0 ± 1.1, respectively. The average number of additional cardiovascular risk factors was 1.5 ± 1.1. Figure 1 shows the prevalence of clustering of cardiovascular risk factors. Among hypertensive patients, 18.7% had no additional risk factor except for hypertension. On the other hand, 34.2%, 28.9% and 18.2% had one, two or more than three additional risk factors, respectively. The prevalence of each risk factor according to the number of comorbid risk factors is shown in Fig. 2. Dyslipidemia was more frequently complicated in the patients with one additional
Comorbid disease according to the number of cardiovascular risk factors.

Number of antihypertensive drugs according to the number of cardiovascular risk factors.

Figure 2.

Figure 3.

risk factor. Similarly, dyslipidemia, obesity and CKD were complicated in the patients with two risk factors. There were no significant differences in BP among these groups, while patients with three or more risk factors group needed greater number of antihypertensive drugs than those with other groups (Table 1, Fig. 3). The achievement rate of good (<140/90 mmHg) and satisfactory (<130/85 mmHg) BP was 81.7% and 40.5%, respectively, in the patients without additional risk factors (Fig. 4). In contrast, BP in those with additional risk factors was less controlled. The patients with three or more risk factors group showed a significantly higher body mass index, serum LDL cholesterol, triglyceride, plasma glucose and serum uric acid levels compared to those in other groups (p<0.05, respectively). They also
showed significantly lower serum HDL cholesterol and eGFR levels compared to those in other groups (p<0.05, respectively). In addition, the prevalence of diuretics in the patients with three or more risk factors group was higher compared to those in other groups. Hyperuricemia was more frequently complicated in the patients taking diuretics compared to those without (32.9% vs 19.3%, p<0.01). Furthermore, the prevalence of DM and obesity in the patients with three or more risk factors group was higher compared to those in other groups. As expected, the prevalence of DM was also higher in the patients with obesity (49.4% vs 35.3%, p<0.05).

Discussion

The American and European guidelines as well as the Japanese guidelines emphasize the importance of the management of high risk patients, such as patients with multiple risk factors or DM (5, 10, 11). However, the control status of BP in the hypertensive patients with DM/CKD remains inadequate. Several surveys have reported that the proportion of DM patients with controlled BP varied from 4% to 20% (12-14) and the proportion of CKD patients with controlled BP was 29% (15). Although BP control status in our hypertensive patients with multiple risk factors seems somewhat better than that seen in previous studies, strict goal BP levels were not achieved in a significant number of the patients.

Among our hypertensive patients, 81.3% had one or more and 18.2% had three or more additional risk factors, suggesting the clustering of cardiovascular risk factors in the hypertensive patients. This observation is compatible with the previous finding that almost 80% of patients with hypertension had at least one additional cardiovascular risk factor, while 30% of men and 32% of women with hypertension had three or more additional risk factors in the Framingham Heart Study (6). Another study reported that more than 50% of hypertensive patients were complicated with DM, dyslipidemia, or obesity (16). There might be some differences in the prevalence based on study populations and definitions of risk factors, as well as the inclusion of patients with preexisting cardiovascular disease. Each component of metabolic syndrome has been reported to be associated with cardiovascular disease and the risk increases in incremental fashion with the number of components of metabolic syndrome (16-21). The patients with either hypertension or DM components in the formation of a diagnosis of metabolic syndrome had the greatest risk for cardiovascular disease (18, 20), however, it was also suggested that lowering uric acid and lipid can reduce cardiovascular risk (22-24). Because the clustering of three or more metabolic syndrome components increases the incidence of cardiovascular disease, the identification and management of additional risk factors as well as aggressive treatment to achieve recommended BP goals, should be encouraged to prevent cardiovascular events in hypertensive patients.

The limitation of our study includes the definition of dyslipidemia. Elevated LDL-C and high TG/low HDL-C may play different role in the pathogenesis of atherosclerosis, however, we did not analyze these patients separately since the number of patients with low HDL-C was small and TG levels were not necessarily determined at fasting condition.

In conclusion, the prevalence of cardiovascular risk fac-
tors, such as obesity, DM, dyslipidemia, CKD and hyperuricemia was high in hypertensive patients. In addition, the patients with clustering additional risk factors needed a greater number of antihypertensive drugs. More intensive intervention for not only BP but also for other complicated risk factors should be required in hypertensive patients.

References