Relationship between Blood Pressure Control Status and Lifestyle in Hypertensive Outpatients

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Abstract

Objective Lifestyle modification as well as combination antihypertensive therapy is necessary to achieve strict blood pressure (BP) control as advocated by the guidelines for the treatment of hypertension. The aim of this study was to investigate the status of adherence to lifestyle modifications and BP control status in hypertensive outpatients.

Methods and Patients Subjects are 661 hypertensive outpatients who had been followed at National Kyushu Medical Center. We assessed BP control status based on the average clinic BP on two occasions. In addition, we investigated the adherence to the individual items of lifestyle modification by a questionnaire.

Results Average BP was $129 \pm 10/71 \pm 11$ mmHg and overall rate of achieving goal BP was 60.1%. Achieving rate of each target BP category was 83.3% in the elderly patients ($<140/90$ mmHg), 56.7% in the young/middle patients ($<130/85$ mmHg) and 45.5% in the patients with diabetes mellitus/chronic kidney disease/myocardial infarction ($<130/80$ mmHg). Adherence to each item of lifestyle modification was as follows: Patients who answered to be conscious about salt restriction was 80.9%, those with increased intake of fruits/vegetables was 79.0%, reduced intake of cholesterol/saturated fatty acids was 67.9%, presence of obesity was 37.7%, daily exercise for ≥ 30 min was 31.9%, habitual alcohol intake was 38.0%, habitual smoking was 9.8%. Only 22.5% of the patients had no lifestyle items to be modified. On the other hand, 19.6% of patients had more than 3 items to be modified. Subjects with more than 3 lifestyle items to be modified are more frequently found in young, male, and obese groups.

Conclusion We conclude that about 60% of the patients achieved goal BP by the intensive combination therapy. The lifestyle modification seems to be important especially for the young, male and obese patients.

Key words: BP control, combination antihypertensive therapy, diuretics, lifestyle modification, adherence

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Introduction

Blood pressure (BP) control was reported to be inadequate on the basis of either the routine clinic BP or home BP measurement (1-3). The Japanese Society of Hypertension guideline (JSH 2009) emphasizes that the use of two or three drugs including a low dose of diuretic is necessary to achieve the target BP (4). Genetic susceptibility as well as environmental factors related to lifestyle are involved in the development of hypertension. The effectiveness of lifestyle modification on the prevention and management of hypertension has been clearly shown in clinical trials (5, 6). Thus,

lifestyle modification should be indicated for all hypertensive subjects (4, 7, 8). In daily clinical practice, it seems to be important to recognize the lifestyle problems of the patients to be modified.

The aim of this study was to investigate the status of adherence to lifestyle modifications based on self-reporting questionnaire and BP control status in hypertensive outpatients.

Materials and Methods

Subjects were 661 hypertensive outpatients (362 females and 299 males, mean age 66 ± 12 years), who had been fol-

Figure 1. Blood pressure control status in all treated hypertensive patients, elderly patients, young/middle patients and the patients with DM/CKD/MI. DM: diabetes mellitus, CKD: chronic kidney disease, MI: myocardial infarction

lowed at National Kyushu Medical Center in Fukuoka, Japan. Patients with secondary hypertension such as renovascular hypertension and primary aldosteronism were excluded from the study and all patients took antihypertensive medicines for more than 3 months. We assessed BP control status based on the average clinic BP (CBP) on two occasions between May and June in 2010. CBP was measured with a sphygmomanometer by a doctor while the patient was seated. According to JSH 2009, goal BP was defined as SBP of <140 mmHg and DBP of <90 mmHg in elderly patients (≥ 65 years), SBP of <130 mmHg and DBP of <85 mmHg in young or middle age patients, SBP of <130 mmHg and DBP of <80 mmHg in the patients with diabetes mellitus (DM) or chronic kidney disease (CKD) or myocardial infarction (MI). Body mass index (BMI) was calculated as weight/height² (kg/m²). Obesity was defined as having BMI ≥ 25 kg/m². DM was defined as fasting serum glucose ≥ 126 mg/dL, serum glucose ≥ 200 mg/dL at any time, HbA1c $\geq 6.5\%$, or the current use of hypoglycemic agents. CKD was considered to be present if the patient had either decreased estimated glomerular filtration ratio (eGFR) (<60 mL/min) or persistent proteinuria. eGFR was calculated using the following formula: for men, $194 \times \text{serum creatinine levels}^{-1.094} \times \text{age}^{-0.287}$; for women, $194 \times \text{serum creatinine levels}^{-1.094} \times \text{age}^{-0.287} \times 0.739$ (9). MI was diagnosed based on medical history as well as the findings of electrocardiogram, echocardiography or coronary angiography. In addition, we investigated the patient's adherence to the individual item of lifestyle modification by a questionnaire.

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

Statistical analysis

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

Results

In all subjects, average BP in 2010 was $129 \pm 10/71 \pm 11$ mmHg and the proportion of achieving goal BP was 60.1% (Fig. 1). In the elderly patients (<140/90 mmHg), 83.3% achieved their goal BP, followed by 56.7% in the young/middle patients (<130/85 mmHg), and 45.5% in the patients with DM/CKD/MI (<130/80 mmHg). The average number of antihypertensive drugs was 2.3 ± 1.0 in all subjects, 2.1 ± 1.0 in elderly, 2.0 ± 0.9 in young/middle and 2.6 ± 1.1 in DM/CKD/MI. Ca channel blockers and angiotensin II receptor blockers (ARB) were mainly prescribed in all BP category groups. Diuretics were prescribed in 20.1% and there were no significant differences in the use of diuretics between patients with and without DM (22.5% vs. 19.8%, ns). For the diuretics, 57% were provided as fixed-dose combination tablets with ARB.

The items of lifestyle modification advocated by JSH 2009 are shown in Table 1. Adherence to each item of lifestyle modification is shown in Fig. 2. The percentage of patients who responded that they were conscious about salt restriction was 80.9%, those with increased intake of fruits/vegetables was 79.0%, reduced intake of cholesterol/saturated fatty acids was 67.9%, presence of obesity was 37.7%,

Table 1. Items of Lifestyle Modifications for Hypertensive Subjects (4)

1. Salt restriction to <6g/day
2. Increased intake of fruits and vegetables*
Reduced intake of cholesterol and saturated fatty acids
Increased intake of fish (fish oil)
3. Maintaining an appropriate body weight: BMI (body weight [kg]÷{height [m]}²) <25 kg/m²
4. Exercise: In hypertensive patients with no cardiovascular disease, exercise, which is primarily a moderate aerobic exercise, should be performed periodically (for ≥30 min daily if possible)
5. Restriction of alcohol intake: ≤20-30 mL per day in men and ≤10-20 mL per day in women as ethanol
6. Quitting smoking

Comprehensive lifestyle modifications are more effective.

* An increased intake of fruit and vegetables is not recommended for patients with severe renal dysfunction because of the risk of hyperkalemia. An excessive intake of fruit with a high fructose content is not recommended in patients who need to undergo a restricted energy intake, such as obese and diabetic patients.

Figure 2. Adherence to each item of lifestyle modification advocated by JSH 2009. Results on salt restriction, increased intake of fruits/vegetables, reduced intake of cholesterol/saturated fatty acids, presence of obesity, daily exercise for ≥30 min, habitual alcohol intake and habitual smoking are shown.

daily exercise for ≥30 min was 31.9%. The patients with habitual alcohol intake and habitual smoking were 38.0% and 9.8%, respectively. Figure 3 shows the relationship between consciousness of salt restriction and other lifestyle items. The patients who were not-conscious of salt restriction also showed lesser adherence to the intake of fruit/vegetables, reduction of cholesterol/saturated fatty acids and habitual exercise. Habitual alcohol intake was also more prevalent among them.

Only 22.5% of the patients had no lifestyle items to be modified (Fig. 4). On the other hand, 32.0% of patients had one, 25.9% of patients had two, and 19.6% of patients had more than three items to be modified. Subjects with more

than 3 lifestyle items to be modified were found to be more frequently in young, male, and obese groups (Fig. 5). The patients with uncontrolled BP tended to be more prevalent in the patients having more than 3 problems ($p=0.09$).

Discussion

The present study indicates that the proportion of achieving goal BP is 60.1% in all subjects. In our hypertensive patients, the proportion of achieving goal BP significantly increased from 2008 to 2010. In addition, the prescription of diuretics was increased during this period and 57% of diuretics were provided as fixed-dose combination tablets with

Figure 3. Relationship between consciousness of salt restriction and other lifestyle items, such as increased intake of fruits/vegetables, reduced intake of cholesterol/saturated fatty acids, daily exercise for ≥ 30 min, habitual alcohol intake and habitual smoking.

Figure 4. Number of lifestyle items to be modified.

ARB. (unpublished data). The prevalence of patients with achieving goal BP seemed to increase by the intensive antihypertensive combination therapy including diuretics advocated by the guidelines in the present study. Many guidelines for the management of hypertension, such as JNC 7, ESH/ESC 2007 and JSH 2009 guidelines recommend intensive antihypertensive treatment, in particular, the use of diuretics when three or more antihypertensive drugs are required (4, 7, 8). However, the frequency of hypertensive patients treated with diuretics is reported to be low in Japan, being less than 10%. It is well known that diuretics have

several adverse effects, such as hypokalemia, hyperuricemia, dyslipidemia, and impairment of glucose metabolism in addition to volume depletion (10). However, diuretics seem to be effective for the treatment of Japanese hypertensive patients because the salt intake of Japanese remains to be high. Therefore, the use of low-dose thiazide diuretics is recommended to obtain sufficient antihypertensive effects with minimal metabolic adverse effects (11, 12). Fixed-dose combination tablets of ARB with low dose diuretics became available in Japan, which may facilitate the use of diuretics in the process of achieving goal BP. Indeed, the fixed-dose

Figure 5. Frequency of patients with more than three lifestyle items to be modified. F: female, M: male

combination drug was used in 57% of the patients taking diuretics in the present study. The use of fixed-dose combination drugs is advantageous for improving adherence by reducing the number of tablets to be taken (13). However, poor BP control is exclusively found in the young/middle patients or those with DM/CKD/MI for whom low goal BP was advocated. Thus, more aggressive antihypertensive therapy seems to be needed in the young/middle patients or those with DM/CKD/MI.

Another finding of the present study was that subjects with more than 3 lifestyle items to be modified are more frequently found in young, male, and obese groups. The patients with uncontrolled BP also tended to be more prevalent in those with 3 or more lifestyle problems. It is obvious that salt restriction is the most important issue. Indeed, 80.9% of the patients answered to be conscious about salt restriction in this study. However, we have previously reported that 24-h urinary salt excretion is similar between the salt-conscious and salt-unconscious patients (14), suggesting that monitoring the salt excretion is quite important to confirm salt intake of the individual patients. Since long-term compliance of salt restriction is poor in Japanese hypertensive patients (3, 15), the encouragement of other lifestyle modification such as body weight reduction as well as the intensive antihypertensive treatment is required to achieve goal BP (3). The effectiveness of sodium reduction program in combination with weight loss in the treatment of hypertension was also confirmed by the TONE study (6). Visceral obesity, which is closely related to metabolic syndrome, induces not only hypertension but also abnormalities of glucose and lipid metabolism (16). We have previously reported that patients with metabolic syndrome show higher urinary

salt excretion and need more antihypertensive drugs to manage their BP (17). Habitual drinking, male gender and older age are also reported to associate with persistently uncontrolled home BP (2, 18). Since marked BP reduction can be achieved by a combination of salt restriction, weight loss, exercise, restriction of alcohol intake, and a DASH diet (19), comprehensive lifestyle modifications seem to be important for achieving BP control in hypertensive patients, in particular, young male patients with obesity.

The limitation of the present study is that the subjects are hypertensive outpatients who have been followed at a specialized hypertension clinic and the investigation on lifestyle modifications is based on self-reporting. Therefore, the present findings may not indicate the precise current status of lifestyle modification and BP control in the hypertensive patients of Japanese general population. In addition, we have not assessed the doses of antihypertensive medicines. However, JSH 2009 recommends the use of two or three drugs including low dose of diuretics. The low number of antihypertensive drugs seems to contribute to poor BP control.

In conclusion, about 60% of the patients achieved goal BP by the intensive combination therapy. The young, male and obese patients had more lifestyle items to be modified, suggesting the importance of leading these patients to modify individual lifestyle items.

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

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