Blood pressure variability at annual periodic health examination for employees and cardiovascular risk factors

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The employees with hypertension at the annual periodic health examination (HE) for employees in Japan usually receive a re-examination of blood pressure (BP) on another day and are often found to be normotensive. In this study, we analyzed data from the HE at the workplace to determine whether or not such employees should receive medical care. Two groups of subjects were selected. One group (group 1) was composed of 50 subjects with normotension at the HE (controls). Another group (group 2) was composed of 33 subjects with hypertension at the annual HE but with normotension in re-examinations. Cardiovascular risk factors were significantly higher in group 2 than in group 1: mean values of the body mass index (group 1, 22.2 ± 2.7 vs. group 2, 24.3 ± 3.1 kg/m², p < 0.01), total cholesterol (group 1, 197 ± 36 vs. group 2, 222 ± 42 mg/dl, p < 0.01), and low density lipoprotein (group 1, 118 ± 32 vs. group 2, 137 ± 38 mg/dl, p < 0.05). The proportion of the employees with high-normal BP in group 2 (42.5%) was significantly higher than that in group 1 (28.0%) (p < 0.01). These indicate that the employees with hypertension at the annual HE but with normotension in the re-examination require further medical attention and should receive medical supervision. The occupational physician should supervise these employees.

Key words: Blood pressure; cardiovascular risk factors; health examination; hypertension.

INTRODUCTION

Blood pressure (BP) is measured as a part of the annual periodic health examination (HE) for employees in Japan. However, BP measured once a year at the HE cannot represent the average daily BP, since BP is known to fluctuate due to various factors in the environment. The Fifth Report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (JNC V) indicated that hypertension should not be diagnosed on the basis of a single measurement and that BP obtained in a healthcare setting may not reflect the patient's usual or average BP. This Committee has also proposed a new classification of BP, referred to as high-normal BP (i.e. systolic BP between 130 and 139 mmHg, diastolic BP between 85 and 89 mmHg). The employees with hypertension at the HE usually receive a re-examination of BP on another day. They are often found to be normotensive even though the re-examination is performed in the same place by the same method. Such employees do not receive any medical care. A possible origin of this BP variability may be a reaction similar to that in white-coat hypertension, which refers to an elevated BP at a clinic, with normal values at other times. It is reported that subjects with white-coat hypertension were more overweight and had higher plasma triglycerides, insulin, insulin/glucose ratios, and...
lower values of high density lipoprotein than normotensive subjects. In another report on structure and function of the heart, white-coat hypertension in the elderly was associated with greater left ventricular mass than in subjects with normotension. These results indicate that people with white-coat hypertension should receive medical care. Therefore, the possibility may be raised that BP variability, in which the employees are hypertensive at the HE but normotensive at the re-examination, may not be innocuous. In this study, we analyzed data from the HE at the workplace to determine whether or not the employees with hypertension only at the HE should receive medical care.

SUBJECTS AND METHODS

All subjects in this study were given informed consent. Two groups of subjects selected from small- to medium-size manufacturing companies which employed a total of 227 workers were studied. One group (group 1) was composed of 50 subjects with normotension at the HE (controls). These subjects were randomly selected from among those who were age- and sex matched to those in group 2. Another group (group 2) was composed of 33 subjects with hypertension at the annual HE performed in 1994, but with normotension in re-examinations both on another day and at home. None of the subjects was taking antihypertensive medication at the time of this study. The BPs at the HE and in the re-examination were measured by a physician with a mercury sphygmomanometer after the workers were seated for 10 minutes in a quiet room in the daytime. The Korotkoff sounds were auscultated through a stethoscope placed over the brachial artery. The pressure at which the sounds were first heard was determined as the systolic pressure. The pressure at which the sounds disappeared (phase V) was determined as the diastolic pressure. Only the lowest BP value was recorded among values measured more than twice. Hypertension was considered either a systolic BP of more than 140 mmHg, a diastolic BP of more than 90 mmHg, or both. The employees with hypertension at the HE were re-examined by a doctor on another day, and when their BPs were normotensive, they measured their BPs themselves at home several times a day for two weeks when they felt relaxed in the evening or in the morning. Averaged BP values at home were obtained using a calibrated electronic device (OMRON HEM 711). Each device used at the HE and home was calibrated initially, and there was no difference between the two sets of readings.

The data collected at the HE were body weight, height, triglycerides, total cholesterol, high density lipoprotein, low density lipoprotein, uric acid, creatinine, vital and forced-vital capacities and BP. Left ventricular hypertrophy (LVH) index was estimated using electrocardiogram obtained at HE according to Sokolow-Lyon criteria (Sv1+Rv5 is over 35mm). Body mass index (kg/m²) was from height and weight using a standard Japanese equation. Student’s t-test and χ² test were performed in order to evaluate differences in HE results, incidence of LVH and proportion of high-normal BP between the two groups. All data are expressed as mean ± SD.

RESULTS

Thirty-three (30 males and three females) of the 227 workers in this study showed hypertension at the HE but normotension at the re-examination and at home. When they were classified by age, 4.4% were in their 20’s, 8.5% in their 30’s, 27.5% in their 40’s, 29.4% in their 50’s, and 30.0% in their 60’s. The characteristics and mean values of each HE item are shown in the Table 1. Mean values of the body mass index (group 1, 22.7 ± 2.7 vs. group 2, 24.3 ± 3.1 kg/m², p < 0.01), total cholesterol (group 1, 197 ± 36 vs. group 2, 222 ± 42 mg/dl, p < 0.01), and low density lipoprotein (group 1, 118 ± 32 vs. group 2, 137 ± 38 mg/dl, p < 0.05) were significantly higher in group 2 (hypertensives) than in group 1 (controls). The proportion of the employees with high-normal BP in group 2 (42.5%) was significantly higher than that in group 1 (28.0%) (p < 0.01). The incidence of LVH was not significantly different between the two groups.

DISCUSSION

Hypertension is a cause of myocardial infarction, stroke and other cardiovascular diseases. It is essential...
to control blood pressure at the workplace to prevent such diseases. Health promotion at the workplace offers several programmes to improve blood pressure. The employees have opportunities to have medical checks before exercise, exercise guidance, nutritional advice or advice on mental health. Under the management of occupational physicians, the individuals with hypertension can avoid the risk factors which can raise blood pressure such as shift work.

In this study, cardiovascular risk factors such as body mass index, total cholesterol and low density lipoprotein were significantly higher in group 2 than in group 1. These indicate that employees with hypertension at the annual HE but with normotension in the re-examination and at home require further medical attention. Furthermore, such employees are more likely to be found in older generations. This result coincides with that in white-coat hypertension. The increase in BP variability may occur due to the impairment of baroreflex function caused by arteriosclerosis among the elderly. The employees in group 2 had a tendency to be obese and hyperlipidemic. This also coincides with a study of individuals with white-coat hypertension, who were more overweight and had higher levels of triglyceride than normotensive subjects. Thus, it is possible that BP variability in both white-coat hypertension and the cases in this study may be due to a similar mechanism. In JNC V, subjects with high-normal BP were reported to be at an increased risk of developing definite high BP and of experiencing non-fatal or fatal cardiovascular accidents compared to those with lower BP. The employees in group 2 have not been given further medical attention up to the present. Since these risk factors can be managed by changing the employees' lifestyle, the employees in group 2 should receive medical supervision. The occupational physician should manage these employees.

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REFERENCES