ORIGINAL CONTRIBUTION

Hypertension and Its Related Factors in Taiwanese Elderly People

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Background: Our study used data collected in Chung-Hsing Village in May 1998 to evaluate the prevalence of hypertension and its correlates in Taiwanese elderly people.

Methods: All of individuals aged 65 and over were recruited as study subjects. A total of 1093 persons, out of 1774 registered residents, were contacted by face-to-face interview. The response rate was 61.6 percent. However, only 586 respondents had blood tests and completed questionnaires. Analysis in this study was based on these 586 subjects. In order to study the significant correlates of hypertension, the t-test, chi-square analysis, and multivariate logistic regression were used.

Results: Our results showed that 66 percent were men and 34 percent were women. The mean age was 73.1 ± 5.3 years. The proportions of hypertension were 53.09 percent in men and 56.06 percent in women (p > 0.05). After controlling the other covariates, the multivariate logistic regression analysis showed that the significant related factors of hypertension were obesity (OR = 1.88, 95 percent CI = 1.06-3.34, p < 0.05) and renal function impairment (OR = 1.69, 95 percent CI = 1.02-2.80, p < 0.05).

Conclusions: The prevalence of hypertension was high in elderly people. Hypertension is significantly associated with obesity and renal function impairment in elderly people.

INTRODUCTION

Hypertension was identified as one risk factor for cardiovascular disease [1]. Patients treated with antihypertensive drugs could have a 38 percent decrease in cardiovascular mortality [2]. In Taiwan, cardiovascular disease is the third leading cause of death after neoplasm and cerebrovascular disease. Hypertension is the ninth leading cause of death [3]. Early detection and early intervention of hypertension seem to be the keypoint to the
reduction of morbidity and mortality of cerebrovascular disease and cardiovascular disease [4]. In NHANES study, the prevalence of hypertension was over 40 percent of people aged 65 to 74 years [5]. In Liau's report, the prevalence of hypertension in the aged people in Taiwan were 33.2 percent in men and 40.9 percent in women [6]. In Aronow's report, systolic or diastolic hypertension was a risk factor for new coronary events in elderly people [7]. The population aged ≥ 65 years has exceeded 7 percent in Taiwan since 1994, and a continued increase in numbers of elderly people is detected [8]. Up to now, there is little information about the association between hypertension and the cardiovascular risk factors or the sociodemographic factors in Taiwanese elderly people. As a result, health promotion and disease prevention recommendations in elderly people remain uncertain. Thus, it is time to pay attention to the health status of elderly people in this country.

For early detection of hypertension and early identification of its related factors, under conduction of comprehensive health survey studies in elderly people living in Chung-Hsing Village in Taiwan, the prevalence of hypertension and its related factors were investigated.

**SUBJECTS AND METHODS**

In May 1998, a cross-sectional study was conducted in Chung-Hsing Village in Taiwan. All individuals aged 65 and over were candidates for study, totally 1774 subjects according to the official household registration records. A total of 1093 persons out of the potential 1774 subjects participated in this study. The response rate was 61.6 percent. However, only 586 respondents had blood tests and completed questionnaires. Analysis in this study was based on these 586 subjects. Information about the subject’s socioeconomic status, family structure, and educational level was collected using a structured questionnaire by well-trained interviewers in face-to-face interviews.

The subject’s educational level was identified as junior high school or less, senior high school, professional training college, and undergraduate or graduate. If the subject had retired from work, that status was identified. If the subject still lived with a spouse, the marital status was defined as living together. If not, the marital status was defined as living alone.

Blood pressure was measured by a mercury sphygmanometer in the sitting position. Weight and height were measured. Blood samples were obtained in the morning after a 12-hour overnight fasting. A number of biochemical markers, such as total cholesterol, triglyceride, fasting glucose, creatinine, and uric acid were analyzed by a biochemical autoanalyzer (Chem1+, Technicon, USA) at the Department of Clinical Laboratory of Chung-Hsing Hospital within four hours of collection.

Body mass index (BMI) was measured as follows: weight (kg) ÷ height (m)^2. BMI ≥ 28 was defined as obesity, 25 ≤ BMI < 28 as overweight, 20 ≤ BMI < 25 as normal and BMI < 20 as underweight [9]. Hypercholesterolemia was defined as total cholesterol ≥ 5.18 mmol/l and hypertriglyceridemia was defined as triglyceride ≥ 2.26 mmol/l [10]. Hyperglycemia was defined as fasting glucose ≥ 6.05 mmol/l [11]. Subjects were considered to have hypertension if the average of three readings exceeded 140 mmHg systolically and/or 90 mmHg diastolically or current therapy with antihypertensive drugs [12]. Hyperuricemia was defined as serum uric acid ≥ 416.5 µmol/l in men and ≥ 386.8 µmol/l in women [13]. Renal function impairment was defined as creatinine ≥ 132.6 µmol/l [14].

The statistical analysis was performed by the aid of a SAS package (Version 6.12, SAS Institute Inc., Cary, North Carolina).
The methods of statistical analysis were t-test, chi-square analysis, and multivariate logistic regression. Statistical significance was defined as p value less than 0.05.

RESULTS

Among 1093 subjects, 65.7 percent were men and 34.3 percent were women. The mean age was 73.5 ± 5.6 years. Our current study disclosed that 66 percent were men and 34 percent were women out of 586 subjects. The mean age was 73.1 ± 5.3 years. We performed chi-square analysis and t-test to examine the gender and age distributions between the respondent and the non-respondent. No significant difference was observed. Therefore, the potential non-response bias could be minimized. For those elderly people included in this current study, the mean systolic pressure was 131.29 ± 19.14 mmHg in men and 135.30 ± 24.98 mmHg in women (p > 0.05). The mean diastolic pressure was 79.39 ± 11.74 mmHg in men and 80.48 ± 12.76 mmHg in women (p > 0.05).

The results of chi-square analysis for hypertension among the cardiovascular risk factors and the sociodemographic factors were shown in Table 1. The proportions of hypertension were 53.09 percent in men and 56.06 percent in women (p > 0.05). The significant related factors of hypertension were obesity, hypertriglyceridemia, hyperglycemia, hyperuricemia, and renal function impairment.

The results of multivariate logistic regression for hypertension were shown in Table 2. After controlling the other covariates, the significant related factors of hypertension were obesity (odds ratio [OR] = 1.88, 95 percent confidence interval [CI] = 1.06-3.34, p < 0.05) and renal function impairment (OR = 1.69, 95 percent CI = 1.02-2.80, p < 0.05). That is, people with obesity were more likely to have hypertension than people with normal weight. People with renal function impairment were more likely to have hypertension than people with normal renal function. No significant association was found between hypertension and hypercholesterolemia, hypertriglyceridemia, hyperglycemia, or hyperuricemia.

DISCUSSION

Most of people living in Chung-Hsing Village moved to Taiwan from Mainland China after the civil war during their military service. Because most of them were male, the proportion of male in this sample was higher than that of female.

In the Western adult, their probability of being hypertensive (blood pressure greater than 140/90 mmHg) exceeded 50 percent when they reached age 70 [15], this finding was similar to our study. Therefore, the prevalence of hypertension was high in elderly people.

In previous reports, the prevalence of hypertension increased with age [15, 16]. However, no significant association was found between hypertension and age in our study. The real reason for the rise in blood pressure with age was not well established. It needed further evaluation. Our study revealed no significant difference of the prevalence of hypertension between gender in the univariate analysis, this finding was similar to Chou's study [17].

Hypertension, diabetes mellitus, obesity, hypercholesterolemia, hypertriglyceridemia, low serum HDL (high density lipoprotein) cholesterol, cigarette smoking, physical inactivity, increased age, prior cardiovascular disease, and left ventricular hypertrophy are risk factors for cardiovascular disease [1]. The greater the number of the cardiovascular risk factors, the higher the incidence of new cardiovascular events [1]. Clustering of hypertension, obesity, hyperglycemia, hyperlipidemia, and hyperuricemia was disclosed
in numerous studies [13, 18-23]. However, only obesity was associated with hypertension in multivariate logistic regression analysis in our study. This may be due to environmental and racial differences, but the real cause needs further investigation.

In our study, renal function impairment was also associated with hypertension in multivariate logistic regression analysis. Recent reports indicated that renal function damage could cause hypertension [24]. This could be explained by the mechanism that renal function impairment might lead to hemodynamic abnormality, which resulted in increased peripheral resistance and caused hypertension [15]. In the other hand, elevated blood pressure might cause renal damage [25,
Table 2. Results of multivariate logistic regression for hypertension in elderly people.

| Variate                              | EP (SE) | OR     | 95% Cl  |
|--------------------------------------|---------|--------|---------|
| Intercept                            | -0.18 (0.21) |        |         |
| Body mass index (kg/m², normal as reference obesity: |         |        |         |
| Obesity                              | 0.63 (0.29) | 1.88   | 1.06-3.34* |
| Total cholesterol (< 5.18 mmol/l as reference): |         |        |         |
| ≥ 5.18                               | -0.40 (0.23) | 0.67   | 0.42-1.06 |
| Triglyceride (<2.26 mmol/l as reference): |         |        |         |
| ≥ 2.26                               | 0.42 (0.28) | 1.52   | 0.87-2.65 |
| Fasting glucose (<6.05 mmol/l as reference): |         |        |         |
| ≥ 6.05                               | 0.34 (0.30) | 1.40   | 0.79-3.34 |
| Uric acid (men < 416.5; women < 386.8 μmol/l as reference): |         |        |         |
| ≥ 416.5 (women ≥ 386.8 μmol/l)        | 0.14 (0.24) | 1.15   | 0.72-1.84 |
| Creatinine (≤132.6 μmol/l as reference): |         |        |         |
| ≥ 132.6                              | 0.52 (0.26) | 1.69   | 1.02-2.80* |

*p < 0.05
CI, Confidence interval
EP, Estimated parameter
SE, Standard error
OR, Odds ratio

26]. The kidney was one of the target organs affected by hypertension [27]. The available evidence suggested that the control of blood pressure was critical to the preservation of renal function [28]. However, further studies are needed on the mechanisms of renal function impairment in hypertension and on how to preserve renal function in hypertension.

In conclusion, the prevalence of hypertension was high in elderly people. Hypertension is significantly associated with obesity and renal function impairment in elderly people.

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