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Original Research

Ovo-vegetarian diet is associated with lower systemic blood pressure in Taiwanese women

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ABSTRACT

Objective: This study was designed to investigate blood pressure (BP) profiles among Taiwanese women with different dietary patterns.

Study design: Cross-sectional study.

Methods: A total of 269 non-hypertensive Taiwanese women, 40 years of age or older, were surveyed using structured questionnaires, and measurements of BP and physiological parameters were made. To assess differences among vegans, ovo-vegetarians, and meat eaters in terms of BP, demographic, and health behavior data, the chi-squared and Fisher's exact tests were employed for categorical variables, and analysis of variance and independent t-tests were performed for continuous variables. Multiple regression analysis was used to examine the relationship between BP and dietary patterns while controlling for potential confounding factors.

Results: A significant difference was found among the three test groups in terms of age, education, employment, stress, and waist-hip ratio. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) significantly differed among the three groups. After controlling for age, body weight, waist circumference, and hip circumference, the three groups were observed to be a significant risk factor of the SBP and DBP. The SBP and DBP of the ovo-vegetarian group were significantly lower than those of the meat-eater group. No significant differences were found between the vegan and meat-eater groups in terms of SBP and DBP.

Conclusion: Dietary pattern is a likely risk factor for SBP and DBP outcomes in Taiwanese women. In particular, the SBP and DBP of ovo-vegetarians are the lowest among the values observed for all dietary patterns. This finding suggests that an ovo-vegetarian diet is beneficial for long-term BP control and prevention of hypertension in females.

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Introduction

Uncontrolled blood pressure (BP) presents important impacts on health outcomes and healthcare expenditures.^{1,2} According to hypertension guidelines, the normal baseline BP values in adults are 140 mm Hg for systolic blood pressure (SBP) and 90 mm Hg for diastolic blood pressure (DBP).^{3–6} When one's BP exceeds these values, hypertension with significantly increased risk of complications including cardiovascular disease, stroke, diabetes, renal failure, and retinopathy is developed.^{1,3,5,7} The National Health Insurance in Taiwan estimated an overall medical cost of US\$19.7 billion in the year 2013; of this figure, US\$0.8 billion,⁸ or roughly 4.0% of the 2013 cost, was paid for medical costs related to hypertension. In the USA, the estimated direct and indirect medical cost of hypertension in 2011 was US\$46.4 billion,² and this number is expected to increase to an estimated US\$274 billion in 2030.²

Many factors are involved in poorly controlled BP, including intake of high-fat foods, excess salt intake, excess alcohol, lack of exercise, overweight, smoking, stress, complications from the diseases, inadequate treatment regimens, and/or non-adherence.^{1,9–12} Among these factors, diet is one of the most important for BP control.^{5,7,9,12} Several epidemiological and clinical studies have demonstrated a relationship between BP control and dietary patterns.^{13–17} Dietary guidelines for Americans recommend several types of dietary patterns, including vegan, ovo-vegetarian, and meat eater.¹⁸ A clinical study has reported that vegetarians have lower BPs than meat eaters ranging from 7 to 9 mm Hg lower for SBP and 6 to 7 mm Hg lower for DBP.¹⁷ The authors thus concluded that a high intake of vegetables and fruits decreases the systemic BP, consistent with the hypothesis that BP is affected by dietary patterns.

Taiwan has a large devout Buddhist population, most of which is vegetarian, including mainly vegans and ovo-vegetarians. The overall incidence of hypertension in 2007 in Taiwan was 24.2%²⁰ and the incidence of hypertension was lower in women (21.0%) than in men (28.0%).²⁰ This finding is consistent with a report that gender is a confounding factor affecting BP.^{15,16,20,21} A difference between genders has been suggested on account of health behaviors such as alcohol intake, smoking, betel nut chewing, body mass index (BMI), body weight, height, and waist circumference.^{15,16,20–23} Our study, therefore, is designed to examine the possible impacts of different dietary patterns on BP profiles in Taiwanese women.

Methods

Study population and study design

This cross-sectional study was performed by surveying 269 non-hypertensive Taiwanese women using structured questionnaires and BP and physiological measurements. Interviews, which took about 20 minutes, were collected by trained interviewers following standard procedures. The

questionnaire included information concerning demographics and health behaviors.

The questionnaire was first designed for a pilot study on a group of 10 non-hypertensive women. The pilot study aimed to identify ambiguous or unclear wording in the questionnaire. The questionnaire for the full study was slightly adjusted after the pilot study.

The participants in this study were females working in a regional hospital as volunteers from all over Taiwan and recruited by convenience sampling method between March 1, 2013, and October 31, 2013. The study personnel introduced the study purpose to the volunteers who had interest in attending the study in the lobby of the hospital and checked their eligibility. The eligible volunteers were then surveyed after their informed consent forms were obtained. The inclusion criteria for eligible volunteers included: (1) equal to or older than 40 years of age; (2) without hypertensive diagnosis; (3) without taking medication that may influence one's BP; and (4) able to converse. Volunteer candidates were excluded if they had any mental disorder, chronic medical conditions with a life expectancy of less than 6 months, or a poor understanding of the intent of this study.

The study protocol was approved by the research ethics committee (REC) of the Buddhist Tzu-Chi General Hospital (IRB101-109) in Taiwan.

Measurements of variables

The study variables, including dietary patterns, potential confounding factors, and BP values, were analyzed.

Dietary patterns

The participants were introduced to the definition of the different dietary patterns and confirmed that they knew what their own patterns were before they were surveyed. The participants in this study were enrolled and divided into three groups based on their dietary pattern during the prior 6 months according to 2015 dietary guidelines for Americans,¹⁸ Ginter,¹² and the daily food guide for Taiwanese.¹⁹ These dietary patterns included vegan (on grains, vegetables, soy products, fruits, and nuts, but no eggs, meat, fish, or dairy), ovo-vegetarian (on grains, vegetables, soy products, fruits, nuts and at least 1 egg a day, but no meat, fish or dairy), and meat eater (on grains, vegetables, soy products, fruits, nuts, eggs, meat, fish, and dairy).^{12,17–19}

Confounding factors

Demographic variables included age, education, marital status, residence, financial status, and employment. Health behavior variables included alcohol intake, smoking, betel nut chewing, regular exercise, sleeping status, stress, and obesity (BMI, waist-hip ratio [WHR], body weight, waist circumference, and hip circumference). BMI was calculated by measuring body weight (kg) and height (m²). WHR was calculated by measuring waist circumference (cm) and hip circumference (cm).

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