

COMMENTARY

A modified DASH diet is one possible solution for overcoming the unfavorable link between vegetable and salt intake in the Japanese diet

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In the super-aged society of Japan, the potential public health impact of salt reduction for controlling hypertension and cardiovascular disease (CVD) remains large. Life expectancy in Japan increased rapidly after World War II,¹ and is among the highest in the world, at 83.7 years.² Nutrition is reported to be one significant contributor to the increase in life expectancy.¹ Characteristics of the Japanese diet include high consumption of fish/n-3 fatty acids, soy/isoflavones, green tea and salt/salted foods, and relatively low consumption of red meat and saturated fat.³ Although most of these characteristics are considered ‘healthy,’ high consumption of salt—which is associated with high prevalence of hypertension, and possibly with high incidence of CVD⁴—seems to be a major shortcoming of the Japanese diet.⁵ Today, CVD is a leading cause of disability in Japan, along with dementia and musculoskeletal disease,⁶ which together increase the discrepancy between life expectancy and healthy life expectancy. Controlling hypertension and CVD may contribute to decreasing this discrepancy.

In this issue of *Hypertension Research*, Kawamura *et al.*⁷ show the reduction of blood pressure and other cardiovascular risk factors with 2-month use of a modified Dietary Approaches to Stop Hypertension (DASH) diet in Japanese men and women with untreated high-normal blood pressure or stage I hypertension. The original DASH diet,⁸ which is based on low-fat dairy products, fish, chicken and lean meats, and

many natural fruits, vegetables, whole grains, nuts, legumes and seeds, was developed in the US and is difficult to apply directly to the Japanese diet, as dietary habits in Japan differ from those in Western countries. Traditional Japanese dishes generally consist of a staple food (mainly boiled rice), main dish (usually a fish or meat dish), side dish (usually a vegetable dish) and soup (usually miso soup), which is referred to as the *ichi-ju ni-sai* (one soup and two dishes) pattern. Kawamura *et al.* developed a modified DASH diet that is designed for Japanese people but remains consistent with the nutrient composition of the original DASH diet. A typical *ichi-ju ni-sai* pattern is seen in a sample dinner menu, shown in Table 1 of their paper.

Recently, we showed a positive ecological correlation between salt intake (assessed by the National Nutrition Survey) and age-adjusted stroke mortality in the 47 prefectures of Japan (Figure 1a).⁹ A classical ecological study conducted among several regions in Japan in the 1970s previously demonstrated that salt intake and stroke incidence were positively correlated.⁴ Salt intake has shown regional disparities.¹⁰ The public health impact of salt has long been acknowledged and public health workers have worked hard to reduce salt intake in many regions. Nevertheless, this positive ecological correlation remains evident at the prefectural level. Surprisingly, vegetable intake was also positively correlated with age-adjusted stroke mortality (Figure 1b),⁹ despite the fact that a protective association of vegetable consumption with stroke has been reported in previous cohort studies analyzed at the individual level.^{11,12} Figure 1c shows the positive

correlation between salt and vegetable intake in Japan's 47 prefectures.⁹ After adjusting for confounding by salt intake, however, the positive correlation between vegetable intake and stroke mortality was no longer statistically significant ($r=0.129$).⁹ The link between vegetable and salt intake was also confirmed in a cross-sectional study by Okuda *et al.*,¹³ who reported that people with high 24-h urinary sodium excretion had higher consumption of boiled/stewed vegetables and *tsukemono* (Japanese pickles, generally prepared with salt).

Although the salt intake from processed food such as bread and noodle has increased nowadays, breaking the link between vegetable and salt intake in the traditional Japanese diet is an important public health nutritional concern. As long as this link remains intact, people who try to eat more vegetables will consume more salt, and those who try to eat less salt will consume fewer vegetables. The sample menu proposed by Kawamura *et al.* demonstrates how a modified DASH diet could help break this undesirable link. Use of low-sodium soy sauce and no- or low-salt seasonings, such as red pepper and butter for cooking vegetables, can contribute to simultaneously keeping salt intake low and vegetable intake high. We previously reported that use of low-sodium soy sauce and miso (fermented salty soybean paste) resulted in reduced 24-h urinary sodium excretion in a randomized, controlled, double-blind crossover trial.¹⁴ In the blinded condition, study participants and their families easily accepted the taste of low-sodium soy sauce and miso.¹⁴ Preparing typical Japanese vegetable dishes—such as *tsukemono*, *nimono* (boiled vegetables, mainly cooked with soy sauce and sugar) and

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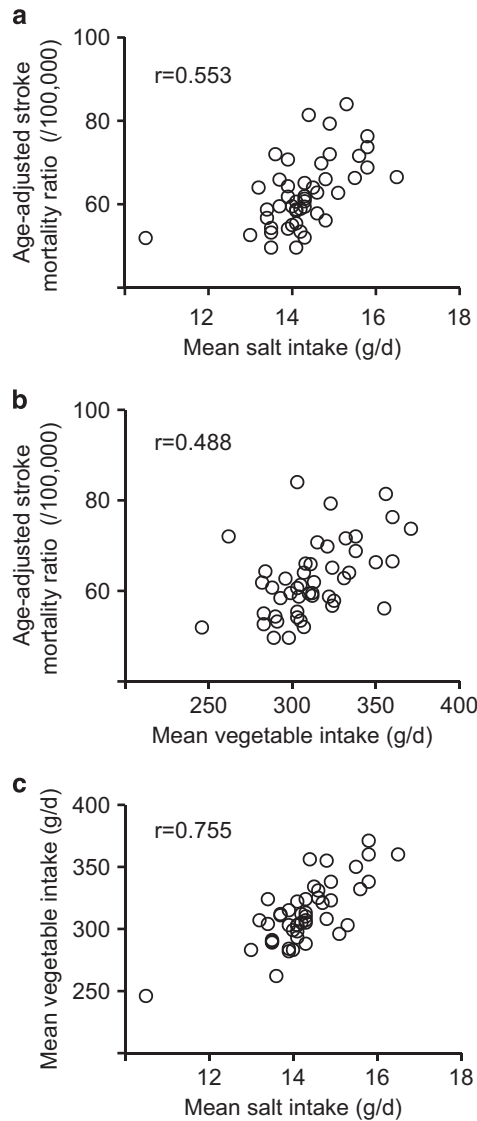


Figure 1 Ecological correlation with Pearson’s correlation coefficients between mean salt intake and age-adjusted stroke mortality ratio (a), between mean vegetable intake and age-adjusted stroke mortality ratio (b) and between mean salt intake and mean vegetable intake (c) among men in 47 prefectures in Japan.⁹ Salt and vegetable intake was obtained from the 1995–1999 National Nutrition Survey. Age-adjusted stroke mortality ratio was obtained from the 2005 National Vital Statistics.

ohitashi (boiled and marinated vegetables, generally cooked with soy sauce)—with less salty seasonings, such as low-sodium soy sauce, vinegar and spices, and flavors or salt substitutes¹⁵ tailored to Japanese dietary patterns and taste preferences should be further developed to achieve a low-salt, high-vegetable diet.

Kawamura’s study sheds light on the application of the DASH diet to help control blood pressure and reduce cardiovascular risk among the Japanese. However, there are still some concerns to be considered. First, as their study had no control

group, it is possible that the results were confounded by unknown biases. Second, because the modified DASH diet was prepared by the research team, the feasibility of the diet for use in the general population is still unknown. If the proposed diet demands special cooking skill, relatively high cost or long preparation time, it could end up being just ‘pie in the sky.’ Further studies of the application and effect of the modified DASH diet to help break the link between salt and vegetable intake and reduce cardiovascular risk in the Japanese diet are required.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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