

# Nara Women's University

【博士論文本文の要約】 Development of simple assessment tool and intervention methods for reduced salt diet

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## 博士学位論文要約

Development of simple assessment tool and intervention methods for reduced salt diet.

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Excessive salt (i.e., total salt equivalent) or salty food intakes is a risk factor for cardiovascular diseases, such as hypertension, coronary heart disease, and cerebral stroke, as well as gastric cancer, which are the leading causes of death globally. Despite recommendations that salt intake should be reduced to less than 5 g/day by the World Health Organization (WHO), that is not practical in most populations, in many areas in the world like Europe, North America, and Asia. Asian people, including Japanese, have the highest levels of salt intake in the world. The mean salt intake among Japanese is 10.1 g, which is still twice the WHO recommendations.

Given that nutritional issues, like excessive salt intake, may vary based on lifestyle, it is important to develop a range of new lifestyle-specific nutrition education approaches. Developing and discussing different approaches in the food environment is meaningful for determine the optimal approaches for each lifestyle throughout the life course.

### **Chapter 1. Performance of a salt check sheet for screening salt intake estimated from 24-hour urinary sodium excretion in middle-aged Japanese.**

One of the factors for not achieving a reduced salt diet may be the difficulties in screening individuals according to their quantitative salt consumption albeit the need for clinical and nutritional education. Multiple 24-hour urine excretion is recognized as a reliable method for evaluating actual salt consumption, but it is not a feasible and versatile screening method because of the heavy burden in urine collection. A food frequency questionnaire (FFQ) comprised a substantial number of foods including salty foods and salt-related behaviors have been widely used in epidemiological studies basically to rank individuals within a study population. However, with regard to the performance of screening using the FFQs, few studies have examined quantitative absolute sodium values compared with the 24-hour urine sodium excretion approach as reference standard.

I examined the validity of using the simplified salt check sheet (13 items) as a quantitative

diagnostic tool by comparing its results with the amount of salt intake measured by 24-hour urinary sodium excretion among 154 participants (57 men and 97 women) to develop a simple assessment method. The salt intake amount was used as a diagnostic criterion, and the corresponding receiver operating characteristic (ROC) curves were prepared based on the sensitivity and specificity of each score. As a result, I indicated the difference in usefulness by gender. This is the first study using 24-hour urinary sodium excretion approach as reference standard to examine the simplified FFQ's excessive salt intake screening performance among healthy people. (The result of this work is currently being submitted.)

## **Chapter 2. Short-term effects of salt restriction via home dishes do not persist in the long term: a randomized control study.**

While tailored salt reduction education that identifies high-risk individuals based on screening may be successful, there is limited evidence on what educational interventions can be effective and on how effective they are for low-risk individuals. The consumption of salt in traditional Asian diets is characterized by a relatively large contribution from discretionary salty seasonings added during food preparation at home. Such discretionary seasoning use is associated with individual's taste preference. Taste preference for miso soup as representative of homemade cooking was suggested to be a proxy index of daily sodium consumption. Therefore, monitoring salt concentrations using a salinity meter can be one of the methods for reducing salt intake via home seasoning as an approach to raise individuals' awareness regarding their saltiness preferences for their dishes. This would lead to increased consciousness on salt intake, thereby facilitating overall reduction of salt intake.

I examined the short-term (3-month) effect of monitoring salt concentrations in homemade dishes, which implies awareness of taste preferences, or using low-sodium seasoning (conventional method) in reducing salt intake, as well as the long-term (9-month) effect after the intervention for development the intervention method. A double-blind randomized controlled trial using a  $2 \times 2$  factorial design with two interventions was conducted in 195 participants; they were assigned to both interventions for a group monitoring salt concentration in soups (control: no monitoring) and a group using low-sodium seasoning (control: regular seasoning). I evaluated 24-hour urinary sodium excretions at baseline, after 3-months of intervention, and at 6- and 12-months after baseline as long-

term follow-up surveys. Urinary sodium excretion decreased in both the intervention and control groups after the intervention. However, differences in the change for both monitoring and low-sodium seasoning interventions were statistically non-significant ( $p = 0.29$  and  $0.52$ , respectively). Urinary sodium excretion returned to the baseline level after 12-months for all groups. In conclusion, the effect of monitoring salt concentrations of homemade dishes was not continuous for long-term and the need for constant intervention was indicated.

### **Chapter3. The Effect of Educational Background Music on Reducing Salt Intake at a University Canteen.**

Further population approaches to reduce salt intake in the food environment, such as eating out, should be considered in Japan, where the externalization of food is progressing. A song regarding the appropriate amount of salt intake consisting of interesting sound and lyrics that encourage salt intake reduction was developed and provided as an educational tool by the government of Nara Prefecture. To the best of my knowledge, the effect of a music on dietary education consisted of interesting sound and lyrics about dietary modification has not yet been examined. Using educational songs as BGM is potentially becoming more frequent and versatile approach in food purchasing and/or eating environments (e.g., canteens in workplaces and schools) to nudge consumers toward healthier choices.

I examined the effect of a dietary educational song regarding the appropriate amount of salt intake as BGM on individual behavioral modification at a university canteen as a new population approach. I displayed visual materials at a university canteen for 5-weeks (control period) and then broadcasted BGM for another 5-weeks (intervention period). The consumption amount of discretionary seasonings and of soup in noodles and the consumption number of soup bowls and of noodles among the consumers, and the changes in the four abovementioned indices during both periods were compared. As a result, reductions in the consumption number of soup bowls and noodles were higher in the intervention period than those in the control period with statistical significance (median values:  $-7.5$  and  $5.4$  per 100 rice consumers,  $p = 0.01$ ; ratios to rice consumers,  $-0.02$  and  $0.10$ ,  $p = 0.02$ , respectively). These results suggest that the use of a dietary education song on salt intake as BGM may be effective in influencing individuals toward healthier menu choices

rather than seasoning behavior at a university's canteen.

#### **Chapter 4. New Environmental-Related Approaches to Improved Eating Behavior and Nutrition across One's Life Course.**

Finally, I reviewed environmental nutritional approaches for each life course to consider an effective population approach. Salt-reduction programs for children may benefit from strategies that actively engage families and teachers, according to a school-based cluster randomized controlled trial (School-EduSalt) in China to reduce salt intake in children and their families. Further, shift workers have increased risk of diet-related chronic conditions due to their eating habits. Moreover, mental illnesses among workers require nutritional approaches because they may have effects on subsequent weight changes. Finally, studies for the elderly suggest the importance of a nutritional approach especially for males living alone to prevent or improve frailty. A 3-month approach that included nutritional education for the elderly reduced frailty, and the effects persisted postintervention.

#### **Conclusion**

I examined the performance of a simple assessment tool and the effects of intervention methods to develop approaches for reduced salt diet. The usefulness of the salt check sheet, simplified questionnaire, may differ by gender. This is the first study using 24-hour urinary sodium excretion approach as reference standard to examine the simplified FFQ's excessive salt intake screening performance among healthy people. From the intervention study, the effect of monitoring the salt concentrations of homemade dishes did not persist in the long-term, and the need for constant intervention was indicated. Regarding a new population approach in the food environment, it was revealed that using a dietary education song on salt intake as BGM is effective in influencing individuals toward making healthier menu choices. Additionally, it was indicated the need of optimizing nutrition education approaches for the life course. These findings will help develop a salt reduction strategy in our country.