

Consumer attitudes, barriers, and meal satisfaction associated with sodium-reduced meal intake at worksite cafeterias

Jounghee Lee¹ and Sohyun Park²

¹Department of Nutrition Education, Graduate School of Education, Kyonggi University, 154-42 Gwangyosan-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do 443-760, Korea

²Institute for Health and Society, Hanyang University, Seoul 133-791, Korea

BACKGROUND/OBJECTIVES: Targeting consumers who consume lunches at their worksite cafeterias would be a valuable approach to reduce sodium intake in South Korea. To assess the relationships between socio-demographic factors, consumer satisfaction, attitudes, barriers and the frequency of sodium-reduced meal intake.

SUBJECTS/METHODS: We implemented a cross-sectional research, analyzing data from 738 consumers aged 18 years or older (327 males and 411 females) at 17 worksite cafeterias in South Korea. We used the ordinary least squares regression analysis to determine the factors related to overall satisfaction with sodium-reduced meal. General linear models with LSD tests were employed to examine the variables that differed by the frequency of sodium-reduced meal intake.

RESULTS: Most subjects always or usually consumed the sodium-reduced meal (49%), followed by sometimes (34%) and rarely or never (18%). Diverse menus, taste and belief in the helpfulness of the sodium-reduced meal significantly increased overall satisfaction with the sodium-reduced diet ($P < 0.05$). We found importance of needs in the following order: 1) 'menu diversity' (4.01 points), 2) 'active promotion' (3.97 points), 3) 'display of nutrition labels in a visible location' (3.96 points), 4) 'improvement of taste' (3.88 points), and 5) 'education of sodium-reduction self-care behaviors' (3.82 points).

CONCLUSION: Dietitians could lead consumers to choose sodium-reduced meals by improving their taste and providing diverse menus for the sodium-reduced meals at worksite cafeterias.

Nutrition Research and Practice 2015;9(6):644-649; doi:10.4162/nrp.2015.9.6.644; pISSN 1976-1457 eISSN 2005-6168

Keywords: Sodium, worksite cafeteria, attitudes, barriers, meal

INTRODUCTION

The high prevalence of hypertension has been one of major public health issues in South Korea. The 2013 Korean National Health and Nutrition Examination Survey (KNHANES) reported that approximately one out of three male adults and approximately one out of four female adults has hypertension, with adults defined as persons 30 years of age or older [1]. Excessive sodium intake is significantly associated with hypertension, which leads to cardiovascular diseases, such as heart attack and stroke [2,3]. One of the main causes of hypertension is high sodium intake [4]. The 2013 KNHANES estimated the mean sodium intake of Korean adults at 4,293 mg/day, which is more than two times the tolerable upper intake level of sodium (UL) of 2,000 mg/day [1]. Additionally, according to that survey, approximately four out of five Korean adults consume sodium in amounts above the UL. Accordingly, sodium reduction is an urgent public health issue in South Korea.

Considering the high number of consumers and excessive sodium intake at worksite cafeterias, targeting consumers of worksite cafeterias for sodium reduction would be an effective

strategy for improving nutrition. Kim *et al.* [5] reported that approximately 3.4 million people per day consume a meal at worksite cafeterias, and this is the second largest group of people who use institutional food services in South Korea. When Min examined the sodium level per meal by the type of food service, worksite cafeteria meals had the highest mean sodium contents (2,236 mg/day/meal), followed by restaurant meals (1,959 mg/day/meal) and home-cooked meals (1,342 mg/day/meal) [6]. Park reported that 10 food service cafeterias supplied 2,778 mg of sodium per meal on average [7]; thus, the sodium content for even one meal was already over the sodium UL of 2,000 mg/day. Therefore, there is an urgent need to reduce sodium consumption at worksite cafeterias.

The Ministry of Food and Drug Safety has implemented a pilot project for sodium reduction at worksite cafeterias since May 2014 [8]. The participating worksite cafeterias gradually reduced the sodium contents of their meals from May to September 2014 [9]. The goal was to have reduced the sodium content of a daily meal to 1,300 mg by the end of September 2014. The average sodium content per meal was 1,523 mg for May 12th-23rd, but the average sodium content was reduced

This project was supported by the Ministry of Food and Drug Safety, South Korea.

⁵ Corresponding Author: Jounghee Lee, Tel. 82-31-249-9295, Fax. 82-31-249-9036, Email. joungheelee@kgu.ac.kr

Received: May 15, 2015, Revised: July 28, 2015, Accepted: July 28, 2015

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

to 1,261 mg per meal for September 15th-26th. The participating worksite cafeterias maintained 1,300 mg of sodium in each meal since October 2014. The worksite cafeterias could choose a sodium reduced meal as the alternative to a regular meal or as one of menu options. It is important to be aware of the consumers' opinions of the sodium-reduced diets.

Many people believe that reducing sodium intake is challenging because they are exposed to cafeteria meals and processed foods, which are high in sodium. It is very important for consumers to have the choice of sodium-reduced diets and to provide nutrition labeling of menu items at cafeterias [4]. A thorough understanding of the factors related to consumers' choice of diet at worksite cafeterias would greatly help in successfully expanding this pilot project to the national level. Because very few studies have been conducted to examine the influencing factors related to sodium-reduced meal choice at worksite cafeterias, the researchers need to explore this in South Korea.

Given the importance of consumer satisfaction, which likely influences the intake of a sodium-reduced meal, it is needed to clarify factors influencing consumer satisfaction for sodium-reduced meal. The aim of this study was to examine the relationships between socio-demographic factors, consumer satisfaction, sodium awareness, barriers and the frequency of sodium-reduced meal intake. We also conducted the needs assessment of consumers to improve sodium-reduced meals.

SUBJECTS AND METHODS

Research participants and procedure

This study examined consumer satisfaction and awareness regarding sodium-reduced meal in 18 worksite cafeterias participating in the government pilot project [9]. Because a dietitian of one worksite refused to participate in this study, this research included 17 worksite cafeterias. In November 2014, the target population was Korean consumers 18 years or older in a cross-sectional study. Seventeen dietitians of each worksite cafeteria collected data from 50-60 consumers using convenience sampling. Considering the distributions of age groups and gender of consumers, this study was conducted for three consecutive days and at different time periods during the lunch hour each day: 1st day, 11:30-11:45 & 12:00-12:15; 2nd day, 11:45-12:00 & 12:15-30; 3rd day, 12:00-12:15 & 12:30-12:45. The Hanyang University institutional review board approved this study (IRB-HYI-14-083-1) prior to initiation of this project.

To increase the quality and completeness of the data, dietitians checked each completed questionnaire for missing data. Seventeen dietitians initially recruited 955 subjects; however, after excluding questionnaires with missing values for the variables of interest and research participants without having opportunities to choose sodium reduced meals, a final dataset of 738 completed questionnaires.

General characteristics of subjects

The self-administered questionnaire included socio-demographic information, such as gender, age and occupation type. Moreover, it also included health information, subjective health status, and diagnosis of hypertension.

Frequency of sodium-reduced meal consumption

Subjects indicated the frequency of their sodium-reduced meal intake at the food cafeteria based on five response categories: 'never', 'rarely' (1 time/2 weeks), 'sometimes' (1-2 times/week), 'usually' (3-4 times/week) and 'always' (5 times/week). To have enough subjects in each group for data analysis, we combined two groups into one group: the 'never/rarely' group and the 'usually/always' group.

Overall satisfaction with sodium-reduced meal and reason for satisfaction

Overall satisfaction with sodium-reduced meal was assessed with the question, "In general, I am satisfied with sodium-reduced meal". Measuring reasons for satisfaction with sodium-reduced meal used five items: 1) more beneficial to my health compared with regular meals, 2) sodium-reduced meal has more variety of menus compared with regular meals, 3) better taste compared with regular meals, 4) inclusion of more variety of food groups compared with regular meals, and 5) more sufficient amount of food provided compared with regular meals [10-12]. We defined regular meals as meals provided without dietary sodium reduction at the food cafeteria. Each question using a five-point Likert scale ranged from "strongly disagree" to "strongly agree". We assessed Cronbach α reliability coefficient to check internal reliability for this scale (Cronbach $\alpha = 0.85$) [13].

Attitudes towards sodium reduction and willingness to reduce sodium intake

Assessment of consumer attitudes regarding sodium reduction used 2 items: 1) benefit of sodium reduction for my health, and 2) importance of providing sodium-reduced meals at the cafeteria [14,15]. We also evaluated willingness to reduce sodium intake on a regular basis. The subjects answered based on a five-point Likert scale from 'strongly disagree' to 'strongly agree' to measure their degree of awareness about sodium reduction.

Barriers to selecting sodium-reduced meal

To assess the barriers to choosing sodium-reduced meal, 2 close-ended questions were used. The first statement was, "my colleagues who eat with me do not like sodium-reduced meals". The second statement was, "when eating at the cafeteria, I find that sodium-reduced meal options are not available because the number of meals provided is limited" [9].

Needs to improve sodium-reduced diet

We employed five items to determine the need of subjects for sodium-reduced meal to be improved: 1) improving the taste of sodium-reduced meals, 2) providing various menus of sodium-reduced meals, 3) actively promoting sodium-reduced meals, 4) displaying nutrition labels of sodium-reduced meals in a visible location, and 5) educating consumers about nutrition behaviors to reduce sodium intake [9,16].

Data analysis

To address the factors affecting overall satisfaction with sodium-reduced meal, we performed the ordinary least-squares

(OLS) regression analysis by employing SPSS (SPSS Inc., version 21, Chicago, IL) [17]. We employed ordinary OLS regression model in which overall satisfaction with reduced sodium meals was the dependent variable and we included age as a covariate [18-20]. Additionally, we included five independent variables: 1) more beneficial to my health, 2) more variety of menus, 3) better taste, 4) more variety of food groups, and 5) more sufficient amount of meal. Chi-square analysis was employed to examine the relationship between categorical variables. We also employed general linear models with covariate of age to assess the difference for the awareness, barriers, meal satisfaction and needs across groups by comparing adjusted means [21]. Tests for least significant differences (LSD) were performed to determine significant differences of consumer satisfaction, attitudes, barriers, and the needs of sodium reduced meals between groups by the frequency of sodium-reduced meal intake. A *P*-value of 0.05 was set as the level of significance.

RESULTS

Demographic characteristics

This study included 738 subjects, 327 male consumers (44.3%) and 411 female consumers (55.7%) (Table 1). The study participants were categorized into 'usually/always' (*n* = 360, 48.8%), 'sometimes' (*n* = 248, 33.6%), and 'never/rarely' (*n* = 130, 17.6%) groups based on the frequency of sodium-reduced meal intake. Age was significantly related to the frequency of sodium-reduced meal intake. The mean age of subjects was significantly higher in the 'usually/always' group (38.1 ± 10.1 years) compared to the 'sometimes' (35.5 ± 8.6 years) and 'never/rarely' ($34.0 \pm$

8.7 years) groups. The most common occupation type was officer (45%), followed by professional/researcher (24.9%) and persons in sales/service jobs (20.7%).

Factors influencing overall satisfaction with sodium-reduced meal

The regression model explained 55.9% of the total variance (Adjusted $R^2 = 0.56$). More beneficial to my health ($\beta = 0.429$, $P < 0.001$), sodium-reduced meal has more variety of menus ($\beta = 0.118$, $P < 0.01$), and better taste ($\beta = 0.267$, $P < 0.001$) compared with regular meals significantly influenced overall satisfaction with sodium-reduced meal (Table 2). However, inclusion of more variety of food groups and more sufficient amount of meal provided options did not affect overall satisfaction.

Comparison of consumer satisfaction by the frequency of sodium-reduced meal intake

There were significant differences across the three groups in overall satisfaction with sodium-reduced meal ($P < 0.05$) (Table 3). The 'usually/always' group had a significantly higher overall satisfaction score (4.09 points), followed by the 'sometimes' (3.68 points) and 'never/rarely' (3.47 points) groups. For the reasons for satisfaction with sodium-reduced meal, the 'usually/always' group had a significantly higher score compared to the 'sometimes' and 'never/rarely' groups for more variety of meals, better taste, inclusion of more variety of food groups and sufficient amount of meal provided options ($P < 0.05$) compared with regular meals. However, there were no significant differences in the reasons for consumer satisfaction with sodium-reduced meal between the 'sometimes' and 'never/rarely' groups.

Table 1. Characteristics of the subjects according to the frequency of sodium-reduced meal intake

Variables	Frequency of sodium-reduced meal intake				χ^2 or F-value
	Total (n = 738)	Never/rarely (n = 130)	Sometimes (n = 248)	Usually/always (n = 360)	
Gender					
Male	327 (100.0)	62 (19.0)	101 (30.9)	164 (50.2)	2.12
Female	411 (100.0)	68 (16.5)	147 (35.8)	196 (47.7)	
Age (yrs)					
18-29	202 (100.0)	46 (22.8)	68 (33.7)	88 (43.6)	
30-39	271 (100.0)	50 (18.5)	103 (38.0)	118 (43.5)	18.31**
40-49	179 (100.0)	24 (13.4)	55 (30.7)	100 (55.9)	
≥ 50	86 (100.0)	10 (11.6)	22 (25.6)	54 (62.8)	
Age of subjects (yrs)	36.47 ± 9.49	33.98 ± 8.70^a	35.45 ± 8.59^b	38.07 ± 10.07^b	11.31***
Occupation					
Officer	332 (100.0)	48 (14.5)	123 (37.0)	161 (48.5)	
Sales/service workers	153 (100.0)	32 (20.9)	56 (36.6)	65 (42.5)	12.72
Professional/researcher	184 (100.0)	38 (20.7)	54 (29.3)	92 (50.0)	
Technician/laborer/other	69 (100.0)	12 (17.4)	15 (21.7)	42 (60.9)	
Subjective health status					
Bad	25 (100.0)	5 (20.0)	7 (28.0)	13 (52.0)	5.87
Fair	286 (100.0)	54 (18.9)	108 (37.8)	124 (43.4)	
Good	427 (100.0)	71 (16.6)	133 (31.1)	223 (52.2)	
Diagnosed with hypertension					
Yes	89 (100.0)	20 (22.5)	26 (29.2)	43 (48.3)	1.94
No	649 (100.0)	110 (16.9)	222 (34.2)	317 (48.8)	

n (%) or mean \pm SD.

** $P < 0.01$, *** $P < 0.001$

Different superscripts indicate significant statistical differences.

Table 2. Overall satisfaction with reduced-sodium meal regressed on meal-related perceptions and age (OLS) (n = 738)

Variables	Unstandardized coefficient	Standard error	Standardized coefficient	t-value
Intercept	0.042	0.143		0.297
More beneficial to my health compared with regular meals	0.464	0.032	0.429	14.574***
Sodium-reduced meal has more variety of menus compared with regular meals	0.115	0.035	0.118	3.298**
Better taste compared with regular meals	0.245	0.031	0.267	7.940***
Inclusion of more variety of food groups compared with regular meals	0.068	0.037	0.067	1.822
More sufficient amount of meal provided compared with regular meals	0.050	0.034	0.049	1.449
Age	0.004	0.002	0.050	2.011*

Adjusted R² = 0,56
 *P < 0,05, **P < 0,01, ***P < 0,001

Table 3. Comparison of consumer satisfaction by the frequency of sodium-reduced meal intake

	Frequency of sodium-reduced meal intake			
	Total (n = 738)	Never/rarely (n = 130)	Sometimes (n = 248)	Usually/always (n = 360)
In general, I am satisfied with sodium-reduced meal	3.74 ± 0.03	3.47 ± 0.07 ^a	3.68 ± 0.05 ^b	4.09 ± 0.04 ^c
More beneficial to my health compared with regular meals	4.07 ± 0.03	3.93 ± 0.07 ^a	3.99 ± 0.05 ^a	4.28 ± 0.04 ^b
Sodium-reduced meal has more variety of menu compared with regular meals	3.68 ± 0.03	3.51 ± 0.07 ^a	3.58 ± 0.05 ^a	3.95 ± 0.05 ^b
Better taste compared with regular meals	3.38 ± 0.04	3.17 ± 0.08 ^a	3.35 ± 0.06 ^a	3.61 ± 0.05 ^b
Inclusion of more variety of food groups compared with regular meals	3.79 ± 0.03	3.64 ± 0.07 ^a	3.73 ± 0.05 ^a	3.98 ± 0.04 ^b
More sufficient amount of food provided compared with regular meals	3.71 ± 0.03	3.52 ± 0.07 ^a	3.66 ± 0.05 ^a	3.96 ± 0.04 ^b

Mean ± SEM, all means adjusted for age.
 * P < 0,05
 Different superscripts indicate statistically significant differences.
 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

Table 4. Comparison of consumer attitudes, willingness, and barriers by the frequency of sodium-reduced meal intake

	Frequency of sodium-reduced meal intake			
	Total (n = 738)	Never/rarely (n = 130)	Sometimes (n = 248)	Usually/always (n = 360)
Attitudes				
Benefit of sodium reduction for my health	4.29 ± 0.03	4.22 ± 0.06 ^a	4.22 ± 0.05 ^a	4.42 ± 0.04 ^b
Importance of providing sodium-reduced meals at the cafeteria	4.19 ± 0.03	4.06 ± 0.07 ^a	4.21 ± 0.05 ^{a,b}	4.31 ± 0.04 ^b
Willingness				
Willingness to reduce sodium intake on a regular basis	4.26 ± 0.03	4.16 ± 0.06 ^a	4.24 ± 0.05 ^a	4.39 ± 0.04 ^b
Barriers				
My colleagues who eat with me do not like sodium-reduced meals	2.32 ± 0.04	2.81 ± 0.08 ^a	2.24 ± 0.06 ^b	1.90 ± 0.05 ^c
When eating at the cafeteria, I find that sodium-reduced meal options are not available because the number of meals provided is limited	2.47 ± 0.04	2.63 ± 0.09 ^a	2.50 ± 0.07 ^a	2.28 ± 0.06 ^b

Mean ± SEM, all means adjusted for age.
 * P < 0,05
 Different superscripts indicate statistically significant differences.
 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

Table 5. Need assessment of consumers to improve sodium-reduced meal

	Frequency of sodium-reduced meal intake			
	Total (n = 738)	Never/rarely (n = 130)	Sometimes (n = 248)	Usually/always (n = 360)
Improving the taste of sodium-reduced meals	3.88 ± 0.03	3.85 ± 0.08	3.90 ± 0.05	3.91 ± 0.05
Providing various menus of sodium-reduced meals	4.01 ± 0.03	3.98 ± 0.07	3.99 ± 0.05	4.08 ± 0.05
Actively promoting sodium-reduced meals	3.97 ± 0.04	4.01 ± 0.08	3.92 ± 0.06	3.98 ± 0.05
Displaying nutrition labels of sodium-reduced meals in a visible location	3.96 ± 0.04	3.99 ± 0.08	3.93 ± 0.06	3.96 ± 0.05
Educating consumers about nutrition behaviors to reduce sodium intake	3.82 ± 0.04	3.84 ± 0.08	3.82 ± 0.06	3.81 ± 0.05

Mean ± SEM, all means adjusted for age.
 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

Comparison of attitudes towards sodium reduction and willingness to reduce sodium intake

Regardless of the frequency of sodium-reduced meal intake, consumer attitudes scores were very high for 2 items in the

following order: 1) benefit of sodium reduction for my health (4.29 points), and 2) importance of providing sodium-reduced meals at the cafeteria (4.19 points) (Table 4). The score of willingness to reduce sodium intake on a regular basis was also

high (4.26 points). The scores of all 3 items of consumer attitudes and willingness were significantly higher in the 'usually/always' group compared to 'never/rarely' and 'sometimes' groups ($P < 0.05$).

The score of one barrier, "my colleagues who eat with me do not like sodium-reduced meals", was significantly higher in the 'never/rarely' group (2.81 points) compared to 'sometimes' (2.24 points) and 'usually/always' (1.90 points) groups ($P < 0.05$). Moreover, the 'never/rarely' and 'sometimes' groups showed significantly higher scores on limited availability of sodium reduced meal options compared to 'usually/always' group ($P < 0.05$).

Need assessment of consumers to improve sodium-reduced meal

For the need assessment for sodium-reduced meal improvement, providing various menus of sodium-reduced meals had the highest score (4.01 points) (Table 5). Actively promoting sodium-reduced meals had the next highest score (3.97 points). The rest of the answers had scores in the following order from highest to lowest: displaying nutrition labels of sodium-reduced meals in a visible location (3.96 points), improving the taste of sodium-reduced meals (3.88 points) and educating consumers about nutrition behaviors to reduce sodium intake (3.82 points).

DISCUSSION

This study examined socio-economic factors, consumer attitudes, barriers, and consumer satisfaction related to the frequency use of sodium-reduced meal. The total number of subjects was 738 consumers, 327 males (44.3%) and 411 females (55.7%), that eat lunch at worksite cafeterias. For the factors influencing overall satisfaction with sodium-reduced meal, higher overall satisfaction were significantly associated with 'more beneficial to my health compared with regular meals', good taste and the provision of sodium-reduced menu with variety. However, the inclusion of a variety of food groups and sufficient amount of meal provided did not affect overall satisfaction with sodium-reduced meal. The results of the needs assessment indicated the following order of importance of needs: 1) 'menu diversity', 2) 'active promotion', 3) 'display of nutrition labels in a visible location', 4) 'improvement of taste', and 5) 'education of self-care behaviors for sodium reduction'. We found that menu diversity was a significant factor affecting overall satisfaction and the consumers also had the highest levels of needs for menu diversity of sodium-reduced meals. This evidence indicates we need to work on menu development for sodium-reduced meals.

Younger consumers tend to choose the sodium-reduced diet less frequently than older consumers. Park *et al.* reported that younger subjects showed a lower intent to reduce their present sodium intake compared with older subjects [22]. Moreover, Sarmugam *et al.* [23] indicated that age was negatively associated with discretionary salt use. This study also demonstrated similar results: younger consumers were significantly associated with a lower frequency of sodium-reduced meal intake. Although it is well known that the elderly has a lower detection threshold for salty taste [24], it seems that consumer awareness of sodium is a more important contributing factor that lead to choosing

a low-sodium meal than sodium preference among older subjects in this study. Accordingly, it is urgently needed to target younger consumers to raise their interest and motivation in engaging in behaviors that reduce sodium intake.

Taste and menu diversity were the key influencing factors for increasing overall satisfaction with reduced-sodium meal among consumers. Glanz *et al.* [25] also indicated that the most significant influencing factors on food choice are taste followed by cost and nutrition. This study showed that if the menu for the sodium-reduced meal is monotonous, it could limit consumers' overall satisfaction. However, dietitians addressed difficulties in providing sodium-reduced meal options because menus for sodium-reduced meals are still limited at worksite cafeterias [9]. Lee and Park reported that dietitians wanted more technical support for cooking methods and the composition of the menu. Although a few recipe books for sodium-reduced meal were available [26,27], the application of recipes from these books in the institutional food service industry is very limited due to the complex cooking process, longer cooking time, high cost, and high labor demand that these recipes require. Without taking into account the concerns of dietitians, it will be difficult to successfully implement this nutrition intervention. Therefore, the nutrition professionals need to develop a recipe book of sodium-reduced meals specifically for dietitians and cooks working at worksite cafeterias.

This study showed that consumers have a high level of attitudes and willingness toward salt reduction. The mean values were over 4 points (maximum 5 points) for all these three items of salt reduction: 1) benefit of sodium reduction for my health, 2) importance of providing sodium-reduced meals at the cafeteria, and 3) willingness to reduce sodium intake on a regular basis. The Ministry of Food and Drug Safety implemented the sodium reduction policy in 2005 [28]. Public education messages for sodium reduction have covered diverse issues, sodium contents of foods, diseases related to high sodium intake, and cooking skills. The importance of sodium reduction has been emphasized through diverse types of mass media, including TV, newspaper, magazine and radio [29]. Lee reported that sodium reduction, sponsored by the Ministry of Food and Drug Safety, was the most well-known public relations campaign in South Korea [29]. Educational information on sodium reduction through various mass media channels can raise awareness among consumers.

This study has revealed critical information on the current state of attitudes, barriers, and satisfaction related to sodium-reduced meal among consumers at worksite cafeterias in South Korea. However, there are a few study limitations. First, due to small size of technicians and manual workers, we could not identify sodium-reduced meal related perceptions and barriers by occupation. Second, this cross-sectional study included only the intervention group as samples. Therefore, we could not explore changes in frequent use of sodium-reduced meal between before and after intervention. Future studies need to explore the relationship between occupation and sodium-reduced meal intake. Moreover, an experimental survey with a nutrition intervention cafeteria group and a control cafeteria group to examine changes in knowledge, attitude, self-efficacy, and sodium reduction behavior among consumers would provide

useful information.

The provision of sodium-reduced meal is critical to improve the nutritional status of consumers at worksite cafeterias because those cafeterias serve high sodium meals. Dietitians should try to improve the taste of sodium-reduced meals and provide diverse menu options for sodium-reduced meals to help make the sodium reduction program at worksite cafeterias successful. The Ministry of Food and Drug Safety has suggested a cooking method for sodium reduction: 1) use natural seasoning such as mushroom powder, anchovy powder, and perilla powder instead of salt, 2) use vinegar or juice of a lemon for sour taste, 3) use strong flavored vegetables such as perilla leaf, crown daisy, chili and water parsley to make smell and taste of food better [30]. Furthermore, nutrition policy makers could promote this nutrition intervention through technical, financial, and administrative support for menu development. Based on the findings of this needs assessment, nutrition policy makers need to implement an active promotion strategy to urge consumers to choose the sodium-reduced meal and provide a guideline for displaying nutrition labels of the meal at worksite cafeterias.

REFERENCES

1. Ministry of Health and Welfare, Korea Centers for Disease Control and Prevention. Korea Health Statistics 2013: Korea National Health and Nutrition Examination Survey (KNHANES VI-1). Cheongju: Korea Centers for Disease Control and Prevention; 2014.
2. Strazzullo P, D'Elia L, Kandala NB, Cappuccio FP. Salt intake, stroke, and cardiovascular disease: meta-analysis of prospective studies. *BMJ* 2009;339:b4567.
3. Penz ED, Joffres MR, Campbell NR. Reducing dietary sodium and decreases in cardiovascular disease in Canada. *Can J Cardiol* 2008;24:497-501.
4. Loria CM, Obarzanek E, Ernst ND. Choose and prepare foods with less salt: dietary advice for all Americans. *J Nutr* 2001;131:536S-551S.
5. Kim HR, Kwak NS, Kim ES, Jo YY. Improving National Diet by Promoting the Nutrition Management of Institutional Foodservice. Sejong: Korean Institute for Health and Social Affairs; 2010.
6. Min JH. Analysis on dietary related factors by sodium intake in adults: using the data from 2007, 2008 Korean National Health and Nutrition Survey [master's thesis]. Yongin: Dankook University; 2011.
7. Park HR, Jeong GO, Lee SL, Kim JY, Kang SA, Park KY, Ryou HJ. Workers intake too much salt from dishes of eating out and food service cafeterias; direct chemical analysis of sodium content. *Nutr Res Pract* 2009;3:328-33.
8. Ministry of Food and Drug Safety. Choose a Sodium Reduced Diet at Restaurants and Worksite Cafeterias. Cheongju: Ministry of Food and Drug Safety; 2014.
9. Lee JH, Park SH. Development of the Evaluation Standards for Sodium Reduction at Worksite Cafeterias. Suwon: Kyonggi University; 2014.
10. Arcand J, Mendoza J, Qi Y, Henson S, Lou W, L'Abbe MR. Results of a national survey examining Canadians' concern, actions, barriers, and support for dietary sodium reduction interventions. *Can J Cardiol* 2013;29:628-31.
11. Jung SN. A study on the sodium intake and dietary performance in patients of general and low salt diet [master's thesis]. Seoul: Yonsei University; 2009.
12. Joung KS. Studies on the meal preference and adaptability on low sodium diet [master's thesis]. Kyungsan: Yeungnam University; 2008.
13. Parmer SM, Salisbury-Glennon J, Shannon D, Struempfer B. School gardens: an experiential learning approach for a nutrition education program to increase fruit and vegetable knowledge, preference, and consumption among second-grade students. *J Nutr Educ Behav* 2009;41:212-7.
14. Lee KS. Study on the perception of school dietitians about sodium and the analysis on sodium reduction using [master's thesis]. Suwon: Kyonggi University; 2012.
15. Grimes CA, Riddell LJ, Nowson CA. Consumer knowledge and attitudes to salt intake and labelled salt information. *Appetite* 2009; 53:189-94.
16. Yoon JS. Developing Nutrition Education Model for Reducing Sodium Intake and Evaluation. Daegu: Keimyung University; 2011.
17. Mohalijah MA, Boo HC, Muhammad Shahrin AK, Ainul Zakiah AB. Factors affecting dining satisfaction and acceptability of food item among athletes during a sporting event. *Int Food Res J* 2014;21: 1719-24.
18. McIntosh A, Kubena KS, Tolle G, Dean W, Kim MJ, Jan JS, Anding J. Determinants of children's use of and time spent in fast-food and full-service restaurants. *J Nutr Educ Behav* 2011;43:142-9.
19. Dubowitz T, Cohen DA, Huang CY, Beckman RA, Collins RL. Using a grocery list is associated with a healthier diet and lower BMI among very high-risk adults. *J Nutr Educ Behav* 2015;47:259-64.
20. Oh JH, Chung SW. Multivariate analysis for clinicians. *Clin Should Elbow* 2013;16:63-72.
21. Nowson CA, Worsley A, Margerison C, Jorna MK, Godfrey SJ, Booth A. Blood pressure change with weight loss is affected by diet type in men. *Am J Clin Nutr* 2005;81:983-9.
22. Park S, Lee J, Kwon KI, Kim JW, Byun JE, Kang BW, Choi BY, Park HK. Early adulthood: an overlooked age group in national sodium reduction initiatives in South Korea. *Nutr Res Pract* 2014;8:719-23.
23. Sarmugam R, Worsley A, Wang W. An examination of the mediating role of salt knowledge and beliefs on the relationship between socio-demographic factors and discretionary salt use: a cross-sectional study. *Int J Behav Nutr Phys Act* 2013;10:25-33.
24. Mojet J, Christ-Hazelhof E, Heidema J. Taste perception with age: generic or specific losses in threshold sensitivity to the five basic tastes? *Chem Senses* 2001;26:845-60.
25. Glanz K, Basil M, Maibach E, Goldberg J, Snyder D. Why Americans eat what they do: taste, nutrition, cost, convenience, and weight control concerns as influences on food consumption. *J Am Diet Assoc* 1998;98:1118-26.
26. Lee HS. Low Sodium Recipes. Cheongju: Ministry of Food and Drug Safety; 2011.
27. Nam KS, Heo GY, Kim HS. Low Salt Diet: a Spoon of Salt Threat My Body. Seoul: Miho Publishing; 2012.
28. Kang BW. Sodium Reduction Policy. Cheongju: Ministry of Food and Drug Safety; 2011.
29. Lee SH. The study on the public relations analysis and strategy of the Ministry of Food and Drug Safety. Cheongju: Ministry of Food and Drug Safety; 2014.
30. Yoon EK, Do MJ. Low Sodium and Low Sugar Recipes for School Menus. Seoul: Ministry of Food and Drug Safety; 2009.