

Original Article

Nutritional quality and patterns of lunch menus at child care centers in South Korea and Japan

Sooyoun Kwon PhD, RD¹, Yoonjae Yeoh PhD, RD², Satoko Abe BSc³

¹Department of Food and Nutrition, Honam University, Gwangju, Republic of Korea

²Headquarters for Center for Children's Foodservice Management, Chungcheongbuk-do, Republic of Korea

³Department of Food and Nutrition, Seoul National University, Seoul, Republic of Korea

Background and Objectives: This study aimed to investigate the nutritional quality and patterns of lunch menus provided by child care centers in South Korea and Japan. **Methods and Study Design:** The weekly lunch menus from Monday to Saturday that child care centers provided in November 2014 in South Korea and Japan were analyzed. For Korea, a total of 72 meals provided by 12 centers in Seoul were analyzed by referring to the homepage of the Center for Children's Foodservice Management, which serviced menus for child care centers. For Japan, a total of 30 meals provided by 5 child care centers in Tokyo were analyzed. Nutrient content and pattern in lunch menus were evaluated. **Results:** The lunch menus in Korea and Japan provided 359.5 kcal (25.7% of the estimated energy requirement) and 376.3 kcal (29.5% of the estimated energy requirement), respectively. 'Rice + Soup + Main dish + Side dish I + Side dish II' were provided in 66.7% of meals in Korea, while various patterns with rice and soup as their bases were provided in Japan. **Conclusions:** The lunch menus of child care centers in Korea and Japan provide similar amounts of energy, protein, carbohydrate, vitamin A, calcium, and other nutrients. However, there were significant differences in the lunch menu patterns in Korea and Japan. This study provides information about the nutritional content and pattern of lunch menus at child care centers in Asian countries with rice as a staple food.

Key Words: lunch menu, child care centers, menu pattern, food service, Korea and Japan

INTRODUCTION

Children increasingly eat meals in child care centers, owing to changes in social structure. In South Korea, as of December 2014, 43,770 child care centers were in operation, and provided care for about 1.5 million children and toddlers, corresponding to one-third of all children in South Korea.¹ In Japan, as of April 2014, 24,425 child care centers provided care for about 2.27 million children and toddlers, corresponding to 35.9% of all children in Japan.²

In South Korea, the government enacted the Infant Care Act in 1991 to regulate child-care centers. In 2004, a revision of the Infant Care Act³ added food service management to the regulation of child care centers. Therefore, systematic management of food service in child care centers has only been operational in South Korea for about 10 years. In contrast, the Japanese government enacted the Child Welfare Act to regulate child care centers in 1947,⁴ and added standards for food service in 1948.⁵ Japan has managed food service in child care centers for more than 50 years longer than South Korea.

Food service in child care centers should provide lunch menus that meet nutritional requirements for appropriate growth. In South Korea, the Guidelines for Child Care Centers state that food service should be provided for children in all-day classes, with lunch and snacks in the morning and afternoon.⁶ Japan provides lunch according to the Child Care Guidelines for Child Care Centers. In

contrast to South Korea, the number of snacks in child care centers differs depending on the ages of the children. Food service provides 1-2-year-old children with lunch and two snacks per day, and 3-5-year-old children are provided with lunch and 1 afternoon snack per day.⁷

The provisions of Article 10 regarding enforcement and regulation of the Infant Care Act in South Korea include employment standards for dietitians and cooks.³ A center that provides care for at least 100 children should employ a dietitian; if a center is unable to employ a dietitian, a maximum of 5 centers can share a dietitian. In addition, centers that provide care for 40-80 children should employ a cook, and an additional cook should be added for every 80 children.

To support food service management in centers that are not required to employ dietitians because they provide care for less than 100 children, the Special Act on Safety Control of Children's Dietary was enacted in 2008,⁸ and

Corresponding Author: Dr Yoonjae Yeoh, Headquarters for Center for Children Food Service Management, #401, Building 1, Chungbuk Industry University Cooperation Institute, 194-41, Osongsaengmyeong 1-ro, Osongseup, Heungdeok-gu, Cheongju-si, Chungcheongbuk-do, Republic of Korea, 28610.
Tel: +82-43-233-8813; Fax: +82-43-233-8809
Email: ccfsm3-1@naver.com; soonara79@hanmail.net
Manuscript received 20 May 2016. Initial review completed 22 August 2016. Revision accepted 26 October 2016.
doi: 10.6133/apjcn.042017.04

the Center for Children's Foodservice Management was established in 2011. These Centers for Children's Foodservice Management support nutritional management in child care centers, and provide menus appropriate for children according to the Dietary Reference Intake for Koreans.

The Child Welfare Act in Japan provides standards regarding food service management in child care centers, including employment standards for cooks.⁵ Child-care centers in Japan should have 1 cook for up to 45 children, 2 cooks for up to 150 children, and 3 cooks for 151 or more children. However, the act does not provide employment standards for dietitians in child care centers. There is no independent governmental agency for support of food service management in child care centers in Japan, but some local governments hire dietitians who provide regional child care centers with lunch menu planning. Centers without dietitians rely on lunch menu planned by dietitians hired by local governments.

There are two guidelines related to food service and nutritional management in child care centers in South Korea: the child care operation guidelines that regulate food service have been published annually in part by the Ministry of Health and Welfare since 1999,⁶ and a food service operation manual for child care centers was published in 2010.⁹ Japan has also published food service guidelines for child care centers,⁷ similar to those in South Korea.

As the proportion of children using child care centers and the time that children spend in such centers increases, menus have become increasingly important to help provide adequate nutritional intake. Accordingly, Korea has supported child care centers by establishing separate institutions to oversee nutrition management and meals. Japan has a long history of regulating nutrition and meals in child care centers, and other countries may benefit from the data that Korea and Japan have accrued regarding nutrition and meal management.

In Korea, one study investigated the amounts of nutrients in lunches through analysis of child care center menus and compared these values with the actual nutrient intake by children.¹⁰ Another study investigated the mean intake of lunches, including rice, soup, and side dishes such as stir-fried foods, fried foods, and fruit.¹¹ In Japan, one study investigated the daily nutrition and food group intake in child care centers in 2015.¹²

Korea and Japan have similar food cultures, with rice as a dietary staple, and main and side dishes are eaten with rice. However, there have been few reports on the menus or nutritional information for meals provided to children in child care centers. The results of this study will provide East Asian countries and others with data on nutrition and meal management in child care centers in Korea and Japan. As Korea and Japan have developed advanced policies to regulate child care center meals, the data can be used to establish similar policies in other countries.

Thus, this study aimed to investigate lunch menu nutritional value and patterns in child care centers in South Korea and Japan. This study also compared the lunch menus in child care centers in South Korea and Japan, as these countries have similar food cultures based on rice as a staple food.

METHODS

Data collection

This study collected and analyzed data on lunch menus in child care centers in South Korea and Japan. In 2014, 12 of 25 boroughs in Seoul had Centers for Children's Foodservice Management, we collected lunch menu information from the websites of all 12 centers. For Japan, we requested data from the Tokyo city government about the lunch menus that are provided by the 23 boroughs, and conducted an analysis of lunch menus in the 5 boroughs that responded to the request.

In Korea, 72 meals from a week (Monday to Saturday) were selected from among monthly menus of the 12 Centers for Children's Foodservice Management (CCFSM) in Seoul, and 30 meals from 5 boroughs in Tokyo were selected. In addition, 66 lunch menus from 11 CCFSMs in Seoul and 30 lunch menus from 5 boroughs in Tokyo that provided recipes were used for nutrient analysis. The study protocol was reviewed and approved by the Institutional Review Board of Honam University (1041223-201609-HR-025).

Nutrient analysis

The nutrients recommended for food service in Korean schools¹³ were analyzed; these include energy, proteins, vitamin A, vitamin C, thiamine, riboflavin, calcium, and iron. The programs used for this analysis were Can-pro 3.0 provided by the Korean Nutrition Society for data from Korea,¹⁴ and the food component data base from the Ministry of Education, Culture, Sports, Science and Technology for data from Japan.¹⁵

In addition, nutrient content and proportions of energy provided by carbohydrate, protein, and fat in the lunch menu recipes were evaluated. Energy and nutrient intakes as a percentage of recommended dietary allowance for 3-5-year-old children were analyzed. In Korea, the Dietary Reference Intake for Koreans¹⁶ was used, and the Dietary Reference Intake for Japanese¹⁷ was used for the lunch menus in Japan. Since the values for energy and calcium nutrient intake standards for Japanese were different for 3-5-year-old boys and girls, mean values were used for analysis.

Menu pattern analysis

The number of lunch menu items and menu patterns, and food group patterns were analyzed. The number of menu items was calculated according to the names listed in lunch menus. Lunch menu patterns were determined for combinations of menu items. A lunch menu that included rice, soup, a main dish, and two side dishes was described as 'Rice + Soup + Main dish + Side dish I + Side dish II'.

Food group analysis was performed using patterns and scores. The food group pattern was 6-digit codes with G, M, V, F, D, and O. The oil used in seasoning was excluded from the food group code. If all five food groups (grains, meats/fish/eggs/beans, vegetables, fruits, and milk including milk products) were included in a menu, the food group pattern code was presented as G + M + V + F + D. However, if only grains, meats/fish/eggs/beans, and vegetables were included in a menu, the food group pattern code was presented as G + M + V. For scoring, 1 point was added for each food group; thus, inclusion of

Table 1. Energy and nutrient intake based on lunch menus in child care centers in Korea and Japan (mean±SD)

| Energy & nutrient | Korea (n=66) | Japan (n=30) | t value |
|--------------------------|--------------|--------------|-----------|
| Energy (kcal) | 359.5±59.9 | 376.3±39.0 | 1.406 |
| Carbohydrate % of energy | 63.4±7.9 | 58.2±8.7 | -2.890** |
| Protein % of energy | 16.4±4.0 | 15.9±3.1 | -0.702 |
| Fat % of energy | 20.2±7.0 | 24.3±8.3 | 2.525* |
| Protein (g) | 14.9±4.8 | 14.8±2.9 | -0.098 |
| Fat (g) | 8.4±3.9 | 10.3±3.9 | 2.210* |
| Carbohydrate (g) | 56.1±6.6 | 54.6±9.0 | -0.912 |
| Vitamin A (µgRE) | 171.4±126.0 | 337.6±902.8 | 1.473 |
| Vitamin C (mg) | 18.2±8.5 | 40.6±20.6 | 5.721*** |
| Thiamine (mg) | 0.3±0.1 | 0.3±0.2 | 1.629 |
| Riboflavin (mg) | 0.2±0.1 | 0.3±0.4 | 1.998 |
| Calcium (mg) | 107.5±70.4 | 92.5±34.5 | -1.107 |
| Iron (mg) | 3.0±0.9 | 1.9±0.8 | -5.825*** |

* $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Table 2. Energy and nutrient intake based on lunch menus as a percentage of estimated energy requirement and recommended intake in Korea and Japan (mean±SD)

| Energy & nutrient | Korea (n=66) | | Japan (n=30) | | t value |
|-------------------|-------------------|-----------|---------------------|------------|----------|
| Energy (kcal) | 1400 [†] | 25.7±4.3 | 1,275 ^{†‡} | 29.5±3.1 | 4.418*** |
| Protein (g) | 20 | 74.6±24.2 | 25 | 59.3±11.7 | -3.285** |
| Vitamin A (µg RE) | 300 | 57.1±42.0 | 450 | 75.0±200.6 | 0.695 |
| Vitamin C (mg) | 40 | 45.6±21.3 | 45 | 90.2±45.8 | 6.533*** |
| Thiamine (mg) | 0.5 | 49.4±17.6 | 0.7 | 43.0±33.4 | -1.245 |
| Riboflavin (mg) | 0.7 | 27.5±10.7 | 0.8 | 35.8±45.8 | 1.397 |
| Calcium (mg) | 600 | 17.9±11.7 | 575 | 16.1±6.0 | -0.807 |
| Iron (mg) | 7 | 43.5±12.6 | 5.5 | 35.3±14.6 | -2.802* |

[†]Dietary Reference Intakes for Koreans and Japanese.

[‡]1,300 kcal for 3-5-year-old boys, 1,250 kcal for 3-5-year-old girls, average of the values for 3-5-year-old boys and girls.

* $p<0.05$, ** $p<0.01$, *** $p<0.001$.

all food groups resulted in a score of 5 points.

Statistical analysis

All data were analyzed using SPSS v. 19. All data were subjected to descriptive statistics analysis. The chi-square test and t-test were used to identify significant differences between Korea and Japan.

RESULTS

Lunch menu nutrient analysis

Energy and nutrient intake

Data for nutrient content and energy proportions provided by carbohydrate, protein, and fat in the lunch menus were presented in Table 1. Lunch menus in Korea and Japan provided 359.5 kcal and 376.3 kcal of energy, and 14.9 g and 14.8 g of protein, respectively.

The amounts of fat ($p<0.05$), vitamin C ($p<0.001$), and iron ($p<0.001$) were significantly different between the two countries. Compared to Japan, lunches in Korea derived a higher proportion of energy from carbohydrate and protein, and a lower proportion from fat. There were significant differences in the carbohydrate ($p<0.001$) and fat ($p<0.01$) energy proportions, but not for the protein energy proportion.

Energy and nutrients as percentages of the recommended intake

The percentages of recommended intake provided by lunch menus in Korea and Japan were presented in Table

2, which showed significant differences for energy ($p<0.001$), protein ($p<0.01$), vitamin C ($p<0.001$), and iron ($p<0.05$). Lunch menus in Korea met the following percentages of the daily requirements: 25.7% of energy, 74.6% of protein, 45.6% of vitamin C, and 43.5% of iron, whereas corresponding values in Japan were 29.5%, 59.3%, 90.2%, and 35.3%, respectively. Lunch menus provided 17.9% and 16.1% of the recommended calcium intake in Korea and Japan, respectively.

Lunch menu pattern analysis

Number of menu items

In term of the analysis regarding the number of lunch menu items in Korea and Japan, it was shown a significant difference between the countries ($p<0.001$). In Korea, five items appeared on 70.8% of menus; in Japan, four and five items appeared on 43.3% and 30.0% of menus, respectively. The maximum number of menu items was five in Korea, whereas 10% of lunch menus provided six items in Japan.

Menu patterns

Lunch menu patterns were presented in Table 3, which showed a significant difference between the two countries ($p<0.001$). The most common pattern in Korea was 'Rice + Soup + Main Dish + Side Dish I + Side Dish II', accounting for 66.7% of patterns. In contrast, 23.3% of menu patterns in Japan included 'Rice + Soup + Main Dish + Side Dish I'. The pattern of 'Rice + Soup + Main Dish + Side Dish I + Side Dish II + Dessert' and 'Rice +

Table 3. Lunch menu patterns in child care centers in Korea and Japan (n (%))

| Menu pattern | Korea (n=72) | Japan (n=30) | χ^2 value |
|----------------------------------------------------------------|--------------|--------------|----------------|
| Rice + Soup + Main Dish + Side Dish I + Side Dish II | 48 (66.7) | 3 (10.0) | 46.709*** |
| Rice + Soup + Side Dish I | 7 (9.7) | 2 (6.7) | |
| Rice + Soup + Main Dish + Side Dish I | 7 (9.7) | 7 (23.3) | |
| Rice + Soup + Side Dish I + Side Dish II | 4 (5.6) | 0 (0.0) | |
| Rice + Soup + Main Dish + Side Dish I + Side Dish II + Dessert | 0 (0.0) | 3 (10.0) | |
| Rice + Soup + Main Dish + Side Dish I + Dessert | 0 (0.0) | 6 (20.0) | |
| Others [†] | 6 (8.3) | 9 (30.0) | |

[†]Rice + Side Dish I, Rice + Side Dish I + Dessert, etc.

*** $p < 0.001$.

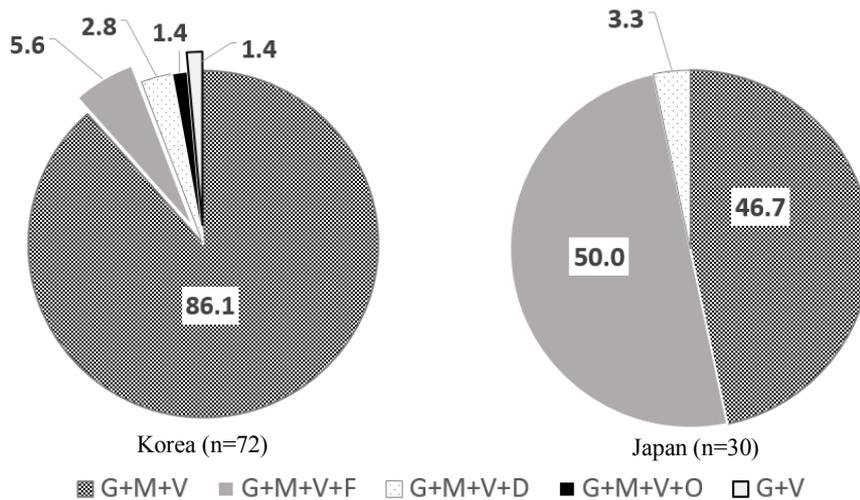


Figure 1. Food group[†] patterns and dietary diversity scores of lunch menus provided by child care centers in Korea and Japan (%). *** $p < 0.001$. [†]G: Grain, M: Meats/fish/eggs/beans, V: Vegetable, F: Fruit, D: Milk and dairy products, O: Oil. *** $p < 0.001$.

'Soup + Main Dish + Side Dish I + Dessert' appeared in Japan.

Food group patterns

The food group patterns in lunch menus were analyzed (Figure 1). The pattern with 'grains + meats/fish/eggs/beans + vegetables (G + M + V)' accounted for 86.1% in Korea. In contrast, the patterns with 'grains + meats/fish/eggs/beans + vegetables + fruit (G + M + V + F)' and 'grains + meats/fish/eggs/beans + vegetables (G + M + V)' accounted for 50.0% and 46.7%, respectively, in Japan; there was a significant difference in the food group pattern between the two countries ($p < 0.001$). Mean food group scores in Korea and Japan were 3.07 and 3.53 out of 5 points, respectively, which was significantly different ($p < 0.001$), indicating that lunch menus in Japan was more varied than in Korea.

DISCUSSION

We analyzed nutritional information for lunch menus provided by child care centers in Korea and Japan, as representative countries of East Asia. According to the analysis, the average energy amounts provided for Korean and Japanese children were 359.5 kcal and 376.3 kcal, respectively. A study in Japan¹² analyzed the total daily intake by children; the actual total energy intake was 1,349 kcal, of which 387 kcal (28.7%) was provided by lunch, similar to the results of this study. When planning a lunch menu, Korea recommends that child care centers

provide 25-30% of estimated energy requirement as lunch and that 3-5-year-old children should receive 350-420 kcal.⁹ Thus, Korean child care centers lunch menus seem to provide the adequate amount of nutrition. However, in a study of Korea, the actual amount of food consumed by the children was 253.9 kcal from a study,¹¹ which was different from the results of this study.

Since the lunch menus are planned for proper children growth and development, correct nutritional management is only possible when children eat in accordance with the suggested diets. Therefore, child care centers should implement instruction during meals time to encourage children to consume proper amounts of energy and nutrients for their age.

The amount of vitamin C provided in Japan is 40.6 mg, which is significantly higher than that provided in Korea, estimated at 18.2 mg. While Japanese 3-5-year-old children eat snack once between meals in the afternoon, Korean children eat snack twice between meals. According to a Korean study on menus of the morning and afternoon snack in child care center, the percentages of vegetables and fruits provided for a morning snack were 25.4% and 32.9%, respectively, indicating that vitamin-rich foods are provided for a morning snack.¹⁸ Korean children eat vegetables and fruits with abundant vitamin C for the morning snack, thus compensating for the lower amount of vitamin C provided in lunch meals, compared to that in Japan.

Korean and Japanese child care centers provide 25.7%

and 29.5% of estimated energy requirement with lunch. Korea provided 74.6% and Japan provided 59.3% of the daily protein requirement, a significant difference. But there were no significant differences in the amount of energy and protein provided in lunch menus. The percentages of energy and protein were different because of difference in estimated energy requirements and recommended intakes in Korea and Japan. Nutritional requirements for 3-5-year-old children were different in the two countries. The estimated energy requirement was 1,400 kcal in Korea for both boys and girls,¹⁶ but this value was 1,300 kcal for boys and 1,250 kcal for girls in Japan,¹⁷ which is lower than the daily recommended amount in Korea. The daily requirement for protein was 20 g in Korea and 25 g in Japan. This difference was reflected in the percentages provided, resulting in a significant difference between the two countries.

The highest number of lunch menu items in Korea was five, but was either four (43.3%) or five (30.0%) in Japan. In Japan, 10% of menus provided six items. In addition, 66.7% of menus in Korea included 'Rice + Soup + Main Dish + Side Dish I + Side Dish II'. On the other hand, Japan provided various menus with rice and soup as their bases, with selective addition of a main dish, side dish, or dessert. Since dessert was additionally provided for lunch, child care centers in Japan were able to provide six menu items.

Most food groups (86.1%) included in lunch menus in Korea were grains, meats/fish/eggs/beans, and vegetables. In contrast, Japanese lunches also included fruit. Thus, the Japanese food group score was 3.53 points, which was higher than that in Korea (3.07 points). Since fruit was often provided as a morning snack in Korea, fruit was not included at lunch.¹⁸

Sasaki et al¹² showed that daily nutritional intake varied among children, depending on their intake from food service at child care centers. Intake of protein, potassium, calcium, iron, vitamin A, vitamin B₂, vitamin C, and dietary fiber was higher on days with food service in child care centers than on days without food service. With regard to food groups, the intake of rice, beans, vegetables, fruit, mushrooms, seaweed, fish and shellfish, milk, and dairy products was significantly higher on days with menu in child care centers; this seemed to be due to the inclusion of fruits and vegetables in menus provided in Japan. The present study found that the lunch menus in child care centers in Korea and Japan were nutritionally planned, although the menu patterns provided were different.

This study has two limitations. First of all, it is difficult to generalize the study results to all Korean and Japanese child care center lunches because the data used for analysis were only collected from the capitals of the two countries, and data for only 5 of 23 boroughs were provided by the Tokyo city government. Secondary, the stated amount of nutrition provided might differ from the actual amount consumed by children because the amount used in the study was estimated from an analysis of the given lunch menu recipes. However, this study is meaningful in that no prior reports evaluated the lunch menus provided for children at Korean and Japanese child care centers.

AUTHOR DISCLOSURES

All authors declare no conflict of interest. This study was supported by a research fund from Honam University, 2015.

REFERENCES

1. Ministry of Health and Welfare. Statistics of child-care 2014. [cited 2015/04/17]; Available from: <http://www.mw.go.kr>.
2. Ministry of Health, Labour and Welfare. Summary of the daycare center related situations. Tokyo: Ministry of Health Labour and Welfare; 2014. (In Japanese)
3. Ministry of Government Legislation. Infant Care Act. Ministry of Government Legislation. [cited 2015/04/17]; Available from: <http://www.law.go.kr/main.html>.
4. Government of Japan. Child Welfare Act. Ministry of Government Legislation. [cited 2015/04/17]; Available from: <http://law.e-gov.go.jp>
5. Ministry of Health, Labour and Welfare. The Standards for the Equipment and Management of the Child Welfare Facilities; 2015. Ministry of Government Legislation. [cited 2015/04/17]; Available from: <http://www.mhlw.go.jp>
6. Ministry of Health and Welfare. Guidelines for Child Care Centers. Ministry of Health and Welfare. [cited 2015/04/17]; Available from: <http://www.mw.go.kr>.
7. Ministry of Health Labour and Welfare. Guidelines for Child Care Centers for Japanese. Tokyo: Ministry of Health Labour and Welfare ; 2010. (In Japanese)
8. Ministry of Government Legislation. Special Act on Safety Control of Children's Dietary. Ministry of Government Legislation. [cited 2015/04/17]; Available from: <http://www.law.go.kr/main.html>.
9. Ministry of Health and Welfare. Guidance of foodservice in child-care center. Ministry of Health and Welfare. [cited 2015/04/17]; Available from: <http://www.mw.go.kr>.
10. Cho MS. Nutrition and health status of day-care center children. Korean J Dietary Culture. 2000;15:313-23. (In Korean)
11. Lee YM, Oh YJ. A study on kindergarten's meal service program and children's food intake. J Nutr Health. 2005;38: 232-41. (In Korean)
12. Sasaki R, Yoshita K, Ishida H. The status of dietary intakes and evaluation of nutrient intakes in children attending day nurseries using the dietary reference intakes for Japanese. J Japan Foodservice Management. 2015;9:45-56. (In Japanese)
13. Ministry of Government Legislation. Enforcement Rule of the School Meals Act. Ministry of Government Legislation. [cited 2015/04/17]; Available from: <http://www.law.go.kr/main.html>.
14. The Korean Nutrition Society. CAN-pro 3.0. Seoul: Publishing Hanahreum; 2010.
15. Ministry of education, culture, sports, science and technology. Food composition database. [cited 2015/04.17]; Available from: <http://fooddb.mext.go.jp/index.pl>.
16. The Korean Nutrition Society. Dietary reference intakes for Koreans. Seoul: The Korean Nutrition Society; 2010. (In Korean)
17. Ministry of Health Labour and Welfare. Dietary reference intakes for Japanese. Japan: Ministry of Health Labour and Welfare; 2010. (In Japanese)
18. Yeoh YJ, Kwon SY, Lee YM. Menu pattern and food diversity of snack menus provided by child-care information centers in Seoul. J Nutr Health. 2014;47:443-51. (In Korean).