Children's Preferences for the Dishes Offered by School Lunch Programs

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Abstract

To evaluate the school lunch program served by elementary schools in Muan, Korea, we examined children's preference for the dishes offered on the menus. School lunch program menus showing the food composition of 400 meals (100 meals in each season) were collected. The serving frequency of each dish on the menus was counted. Eighty-seven representative dishes were selected based on the serving frequency and preference for each dish was determined by a survey of 414 elementary school students who were served by the school lunch program. We also analyzed the nutrient contents of each representative dish. Among the prepared foods, children indicated the highest preference for desserts. Steamed rice was served more frequently as a main course than one dish meals, although children preferred one dish meals to steamed rice. Among side dishes, those that were deep-fried were the most preferred. Children indicated high preference for fruits, milk, and eggs, and low preference for fish and clams, vegetables, and beans. The serving frequency with which main courses, soups, and side dishes were served showed no correlation with children's preference for each. Preference for dishes correlated positively with nutrient contents of calories and lipids, but negatively with nutrient contents of fiber, calcium and vitamin A. According to these results we can suggest that dietitian should consider children's preference into greater consideration to increase menu acceptability and thereby reduce waste. Children need to be educated about the roles and contents of nutrients in food and the fact that preference for foods affects nutrient intake.

Key words: preference, serving frequency, nutritional content, nutritional education

INTRODUCTION

The purposes of school lunch program (SLP) are to provide one third or more of the daily nutrient requirements for children, to promote good dietary habits, and to contribute to a better understanding of nutrition (1). For that reason, SLP should provide children with lunch that contain adequate nutrients and satisfy children's preference, and should provide nutritional education for children.

Developing good dietary habits during childhood is very important (2,3). Good dietary habits built in childhood play an important role in health and well being when they become adults. Choice of food is affected by one's cultural and economic environment and experience for foods (4-6). Children's preference for foods can influence nutrient intakes by affecting food intakes (7) and influence growth of children (8). Lee (6) reported that children's taste preference for sweet, sour, salty and hot influenced anthropometrical measurement and nutrient intakes. In addition, unless the menu planning of an SLP satisfies children's preference, it induces their dissatis-

faction for the SLP, increases waste of foods, and decreases their nutrient intakes (9). Therefore, in managing SLP, it is important that menu should satisfy children's preference and children should be educated to get appropriate preference in order to intake various nutrients for their growth and health.

In this study, we examined three aspects of children's preference for the dishes provided by SLP. First, we analyzed menus to examine serving frequency according to preparation methods and the food groups of the main ingredients. Second, we analyzed children's preference for 87 representative dishes. We also analyzed the correlation between children's preference for each representative dish and its serving frequency to examine whether the menu planning of the SLP satisfied children's preference. Finally, we analyzed the correlation between children's preference for each representative dish and nutrient contents in the dishes to obtain data with which dietitian can educate children about an unbalanced diet by inappropriate preference for foods.

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MATERIALS AND METHODS

Collection of SLP menus

SLP menus were collected from ten elementary schools ocated in Muan, Korea. The recipes for 400 meals were collected. There were 100 meals (consecutive two week menus from ten schools) in each season (April for spring, July for summer, October for fall, and December for winter).

Counting the serving frequency in the SLP menus

The serving frequency of each dish in the menus was classified and counted according to preparation methods and the food groups in which main ingredients are included. In terms of preparation methods, dishes were categorized into four major groups: main courses, soups and pot stews, side dishes, and desserts. Based on the food groups of main ingredients, dishes were categorized into 13 food groups: grains, meats, fish and clams, eggs, beans and bean curd, milk and milk products, anchovies, vegetables, fruits, seaweeds, mushrooms, potatoes, and jelly (Table 1).

Determination of children's preference

Eighty-seven representative dishes were selected from the menus, which were more frequently served (Table 2), and their preference was determined by a survey of elementary school students. Four hundred fourteen ele-

mentary school students who were served by the school lunch program participated in this study (199 male and 215 female). Preference was determined by a five-point hedonic scale (10). The correlation between serving frequency and children's preference for each dish was analyzed. The correlation between the number of ingredients in each dish and children's preference for the dish was also analyzed.

Nutritional analysis of SLP menus

The portion of recipe of each meal was analyzed by a computer-aided nutrition analysis program (CAN Pro, Korea). We obtained the content of calories, protein, lipids, carbohydrates, fiber, calcium, phosphorus, iron, sodium, potassium, vitamin A, thiamin, riboflavin, niacin, vitamin C, and cholesterol in each dish from this analysis. The correlation between every nutrient present in each dish and children's preference for the dishes was also analyzed. Eighty-seven representative dishes were divided into three equal groups according to their preference score: highly-preferred dishes, intermediately-preferred dishes, low-preferred dishes. We tried to determine if there was any difference in averages of nutrient contents among the three groups of dishes.

Statistical analysis

The SPSS statistical program for Windows was used in all statistical analysis. The student t-test was used to

Table 1. Serving frequency of SLP menus (400 menus) studied according to food groups and preparation methods

Preraring methods \ Food groups	Grains	Meats	Fish & clams	Eggs	Beans & bean curd	Milk & milk products	Anchovies	Vegetables	Fruits	Seaweeds	Mushrooms	Potatoes	Jelly	Total
Main courses														
Rice	296													296
One dish meals														
Rice	62													62
Noodles	5													5
Rice cakes	37													37
Gruels	8													8
Breads	2													2
Soup & pot stews														
Soups		58	72	15	13			78		28	3	15		282
Pot stews			3		18			18				1	1	40
Side dishes														
Steamed dishes		16	11	8				7						42
Pan fries	1	12	5	11	2			17		1				49
Stews		16	56	4	10			7				28		121
Stir fries		25	34				18	18		1	4	17		116
Grilled dishes		1	21		3					21				47
Deep fries	5	39	11					10	2			4		71
Salads (boiled)								99						99
Salads (fresh)	1	1						61	11	1				75
Mix w/ seasonings			14					2		6	1		12	35
Kimchies								400						400
Fermented fish & pickle				1										5
Desserts	7					383		4	81					471
Total	424	168	227	39	46	383	18	721	94	57	9	65	12	2263

Table 2. Representative dishes studied

Main courses	Soup & pot stews	Side dishes		Desserts
Steamed rice (Bab)	duck soup	*Steamed dishes*	*Grilled dishes*	milk
rice	jinseng chicken broth	steamed short-ribs	grilled fish	yoghurt
barley bab	yukgaejang	steamed chicken	grilled seaweed	strawberries
soybean bab	beef-rib soup	steamed dried pollack	*Deep fries*	cherrytomatoes
red bean bab	fish pepper pot	steamed egg	pork cutlet	water melon
bean sprout bab	marine product pepper pot	steamed sesame leaves	fish fry	oranges
brown rice bab	spinach fermented soybean paste soup	*Pan fries*	fried chicken	plums
sweet potato bab	bean curd fermented soybean paste soup	pan fried marine product	fried vegetable	apples
One dish meals	Korean cabbage soup	pan fried vegetable	*Boiled salads*	songpyon
hi-rice	mallow fermented soybean paste soup	egg roll	sukju salad	
curry rice	potato fermented soybean paste soup	pan fried meat ball	soybean sprout salad	
pan broiled bab	beef soup	pan fried ham	spinach salad	
jajang bab	soybean sprout soup	*Stews*	young pumkin salad	
bibim bab	egg soup	boiled fish paste stew	*root of bellflower salad*	
rice dumpling soup	dried pollack soup	fish stew	dropwort salad	
seasoned rice cake	short-necked clam soup	bean curd stew	*Fresh salads*	
dumpling soup	brown seaweed soup	beef stew	vegetable mix w/ seasoning	
	cool cucumber soup	potato stew	cucumber salad	
	kimchi pot stew	sausage stew	*lettuce w/ fermented soybean paste*	
	fermented soybean paste pot stew	*Stir fries*	fruit salad	
	uncurdled bean curd pot stew	vegetable stir fry	vegetable salad	
		anchovy stir fry	*Kimchies*	
		jabchae	Korean cabbage kimchi	
		bulgogi	radish kimchi	
		squid stir fry		
		pork stir fry		

determine the difference between preference scores of male and female children. Pearson correlation coefficients were used to assess the relationship between the number of ingredients in each dish and children's preference for the dish, and between every nutrient present in each dish and children's preference for the dish. ANOVA was used to compare the nutrient contents among three groups divided by preference score of the dishes.

RESULTS AND DISCUSSION

Four hundred meals from ten elementary schools were composed of 2,263 dishes. In terms of food groups, vegetables were served most frequently, grains and milk & milk products were the second and the third food groups in frequency, respectively. Desserts, kimchies, steamed rice, and soups were the most frequently served in terms of preparation methods (Table 1). We selected eighty-seven dishes, which were served most frequently, as representative dishes. Eight-seventy representative dishes were composed of steamed rice, one dish meals, soups, pot stews, steamed dishes, pan fries, stew, stir fries, grilled dishes, deep fries, boiled salads, fresh salads, kimchies and desserts (Table 2).

Male children's preference for the menus overall was higher than that of female children except in the case of fresh salads. Among main dishes children preferred one dish meals to steamed rice, although steamed rice was served more frequently. In other researches, children also showed high preference for one dish meals (2,7). Among side dishes children indicated the highest preference for deep fries and kimchies. Lee and Pang (11) and Lee and Chang (5) also reported that children showed high pref-

erence for deep fries such as pork cutlet, hot dog and potato fries. It is also reported that Children in Seoul (7) and Inchoen (5) preferred kimchies. In terms of preparation methods the most frequently served side dishes were kimchies and stews (Table 3). There are a lot of components which have antioxidant effects in the kimchies such as chlorophyll, carotenoids, phenol compounds, vitamin C, sulfur containing compounds (12). These compounds were reported to contribute to protection of antioxidant enzyme in the body (13,14) and scavenging the free radicals which induce lipid peroxidation (15,16). That is one of reason that rice with kimchies and other side dishes, which is Korean traditional dietary style, is good for children's heath compared to fast food. It is reported that children and young adults indicated high preference for fast foods such as Hamburgers and Pizza, which contain a lot of fat and sodium (17). We already mentioned about children's high preference for deep fries. Therefore, dietitian should make an effort to maintain the high preference of children for kimchies by the nutritional education and develop new preparation methods of kimchies. The three most preferred food groups were fruits, milk & anchovies, and eggs, while vegetables, milk, and grains were served more frequently than others (Table 4). Children's preference for dishes showed no correlation with their serving frequency (Table 5). Even though SLP provides lunch, which is nutritionally balanced, a lot of food wasting prohibit children to intake sufficient nutrients for themselves (18). Therefore it would be one of good strategies of SLP to develop and provide one dish meals and side dishes which satisfy children's preference as well as contain adequate nutrients for growth.

Variety of a diet is the most important variable that de-

Table 3. Preference score and serving frequency of representative dishes according to preparation methods

Preparation methods	Preference score				Frequency (ranking)
	Male	Female	Total (ranking)	T-value	
Steamed rice	3.69 ± 0.91[1]	3.53 ± 0.91	3.61 ± 0.91 (11)	1.77	293 (3)
One dish meals	4.76 ± 0.44	4.68 ± 0.45	4.72 ± 0.44 (2)	1.69*[2]	91 (7)
Soups & pot stews	3.71 ± 0.88	3.40 ± 0.81	3.55 ± 0.86 (12)	3.63***	275 (4)
Steamed dishes	3.97 ± 0.86	3.67 ± 0.91	3.81 ± 0.99 (7)	3.44***	37 (11)
Pan fries	3.81 ± 1.01	3.76 ± 0.92	3.78 ± 0.97 (8)	0.58	32 (12)
Stews	3.99 ± 0.85	3.68 ± 0.84	3.83 ± 0.85 (6)	3.76***	108 (5)
Stir fries	3.91 ± 0.72	3.78 ± 0.68	3.84 ± 0.70 (5)	1.93	106 (6)
Grilled dishes	3.90 ± 1.06	3.63 ± 1.01	3.76 ± 1.04 (10)	2.65**	42 (10)
Deep fries	4.56 ± 0.62	4.47 ± 0.62	4.51 ± 0.63 (3)	1.40	44 (3)
Boiled salads	3.03 ± 1.17	2.99 ± 1.05	3.01 ± 1.11 (13)	0.35	88 (13)
Fresh salads	3.71 ± 0.99	3.82 ± 0.86	3.77 ± 0.93 (9)	-1.20	30 (9)
Kimchies	4.16 ± 1.46	4.15 ± 0.95	4.15 ± 1.22 (4)	0.12	376 (1)
Desserts	4.83 ± 0.54	4.76 ± 0.37	4.80 ± 0.46 (1)	1.54	369 (2)

[1]Mean ± SE.
[2]Significantly different between male and female by student t-test.
*p<0.05, **p<0.01, ***p<0.001.

Table 4. Preference score and serving frequency of representative dishes according to food groups

Food groups	Preference score				Frequency (ranking)
	Male	Female	Total (ranking)	T-value	
Grains	4.24±0.55[1]	4.13±0.55	4.18±0.55 (5)	2.10*[2]	390 (3)
Meats	4.23±0.67	3.87±0.71	4.04±0.71 (6)	5.37***	145 (5)
Fish & clams	3.45±1.00	3.15±0.85	3.29±0.93(10)	3.16**	182 (4)
Eggs	4.27±0.88	4.27±0.92	4.27±0.90 (3)	0.07	27(10)
Beans & bean curd	3.78±1.02	3.54±1.06	3.66±1.05 (8)	2.33*	39 (9)
Milk & anchovies	4.38±0.65	4.24±0.70	4.31±0.68 (2)	2.09*	398 (2)
Vegetables	3.45±0.92	3.46±0.70	3.45±0.81 (9)	-0.22	653 (1)
Fruits	4.92±0.68	4.89±0.32	4.90±0.52 (1)	0.53	85 (6)
Seaweeds	4.28±0.91	4.13±0.99	4.20±0.95 (4)	1.66	47 (8)
Potatoes	3.95±0.89	3.77±0.87	3.86±0.89 (7)	2.05*	57 (7)

[1]Mean ± SE.
[2]Significantly different between male and female by student t-test.
*p<0.05, **p<0.01, *p<0.001.

Table 5. Correlation coefficient between children's preference for each dish and serving frequency or number of ingredient for the dish

Preference	Number of dishes	Pearson correlation coefficient	
		r	p
Frequency	87	0.0727	0.503
No. of ingredient	87	-0.0592	0.607

termines the quality of a diet (19). For that reason, it is important to choose various food groups and various foods in a food group to improve quality of a diet especially by providing vitamins, minerals and other trace elements (20). Recently it is reported that variety of a diet positively correlated with the balance of nutrients and growth of children such as weight and height (21). Hatlog also reported that number of food is a good index of evaluating nutrient balance of diet (22). In this study, preference for all dishes did not correlate with the number of ingredients in the dishes (Table 5). In order to provide large number of ingredients in a meal and high quality of diet, it is one of strategies to use more ingredients to prepare dishes which children showed high preference for, such as one dish meals. We also analyzed the relationship between preference for dishes and nutrient contents in the dishes. Preference for all dishes correlated positively with the contents of calories and lipids, while it correlated negatively with the contents of fiber, calcium, and vitamin A (Table 6). Eighty-seven representative dishes were divided into three equal groups according to their preference score: highly-preferred dishes, intermediately-preferred dishes, low-preferred dishes. We tried to determine if there was any difference in averages of nutrient contents among the three groups of dishes. There were more calories and fats, but less fiber, calcium, and vitamin A in highly preferred dishes compared to low preferred dishes (Fig. 1). According to these results, there

Table 6. Correlation coeffcient between preference and nutrient content

Nutrient content	Preference	Peason correlation coefficient	
		r	p
Calories		0.222	0.039*
Protein		-0.014	0.896
Lipid		0.258	0.016*
Carbohydrate		0.179	0.097
Fiber		-0.300	0.005**
Calcium		-0.268	0.012*
Phosphorus		-0.057	0.603
Iron		-0.129	0.233
Sodium		-0.202	0.061
Potassium		-0.174	0.108
Vitamin A		-0.272	0.011*
Thiamin		0.039	0.721
Riboflavin		-0.103	0.721
Niacin		0.067	0.535
Vitamin C		0.025	0.719
Cholesterol		-0.029	0.789

*p<0.05, **p<0.01.

is a possibility that children intake too much calories and lipids but insufficient amount of fiber, calcium, and vitamin A, if they eat lunch only according to their preference for foods. It is reported that obese children has been increasing and too much intake of fat and calories and small intake of fiber can induce obesity (23). Obesity is a major cause of chronic disease such as heart disease, hypertension, arteriosclerosis and diabetes (24). Calcium and vitamin A are also important for growth and development of children (25). Therefore dietitian should educate children about the well balanced diet and the role of nutrients in the body. Children also need to be educated to change some aspects of their preference for food in order to intake appropriate nutrients.

CONCLUSION
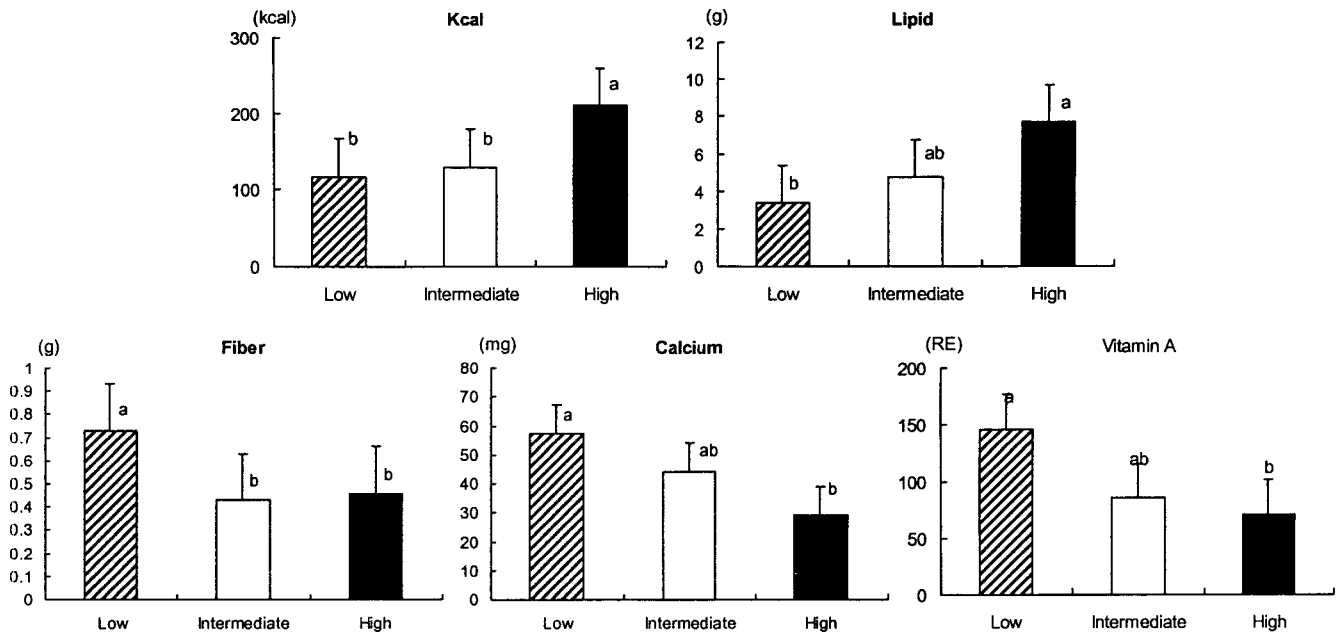
To evaluate the SLP served by elementary schools in

Fig. 1. Comparison of nutrient contents of dishes by preference score.
Values are mean ± SD.
Means with same latter are not significantly different by Duncan's multiple range test (p<0.05).
Low: Low preferred dishes, Intermediate: Intermediately preferred dishes, High: Highly preferred dishes.

Muan, Korea, we examined children's preference for dishes offered on the menus. We also assessed the relationship between the serving frequency of each dish and children's preference for the dish, and nutrients present in each dish and children's preference for the dish.

Unless the menu planning of SLP satisfies children's preferences, it decreases children's nutrient intakes and increases food waste. Therefore, in managing SLP, dietitians should consider children's preferences in order to accomplish the purpose of SLP by increasing menu acceptability and thereby to reduce food waste. In addition, in order to prevent an unbalanced diet and establish good dietary habits, children need to be educated and recognize that preference for foods can affect nutrient intake. They must also learn which nutrients are present in each food, and what the role of each nutrient is in the body.

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