



Eating Habits and Food Preferences of Elementary School Students in Urban and Suburban Areas of Daejeon

Eun-Suk Park¹, Je-Hyuk Lee², Myung-Hee Kim^{2*}

¹Major in Nutrition Education, Graduate School of Education, Kongju National University, Yesan 340-702, Korea

²Department of Food and Nutrition, Kongju National University, Yesan 340-702, Korea

This study investigated the dietary habits and food preferences of elementary school students. The survey was conducted by means of a questionnaire distributed to 4th and 5th grade elementary school students (400 boys and 400 girls) in urban and suburban areas of Daejeon. The results of this study were as follows: male students in urban areas ate breakfast, unbalanced diets, and dairy products more frequently than male students in suburban areas ($p < 0.05$). Female students in urban areas ate dairy products ($p < 0.01$) and fruits ($p < 0.001$) more frequently than female students in suburban areas. Students had the high preferences for boiled rice and noodles with black bean sauce, beef rib soup, steamed beef rib, steamed egg, beef boiled in soy sauce, egg roll, bulgogi, pork cutlet, deep-fried pork covered with sweet and sour starchy sauce, and honeyed juice mixed with fruit as a punch. All students preferred kimchi, although students in the suburban areas preferred kimchi-fried rice ($p < 0.05$), and those in the urban areas preferred bean-paste soup ($p < 0.01$). Students in suburban areas showed a greater preference for seasoned bean sprouts and Altari kimchi. All of the students preferred fruits, rice cake made with glutinous rice, and pizza among other foods. Overall, there were distinct differences in the eating habits and food preferences of elementary school students according to the place of residence.

Key Words: Elementary school students, Eating habit, Food preference, Suburban, Urban

*Corresponding author Myung-Hee Kim

Address Department of Food and Nutrition, Kongju National University, 54 Daehak-ro, Yesan 340-702, Korea

Tel +82-41-330-1463 Fax +82-41-330-1469

E-mail mykim@kongju.ac.kr

Received April 7, 2015

Revised April 13, 2015

Accepted May 21, 2015

© 2015 The Korean Society of Clinical Nutrition

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.

Introduction

In Korea, the school food service was developed in the 1950s to help feed the children at the time of the Korean War, and was enforced by a school feeding law in 1981. This school food service was expanded to the whole country in the 1990s and was fully implemented in all elementary, middle, and high schools nationwide in Korea by 2009 [1]. The purpose of the school food service is to maintain and improve students' health through nutritious meals and to help students establish good dietary habits for a throughout the lifetime [2]. Good eating habits are essential for the physical and emotional development of school age children.

Generally, the eating habits of the people are established from the babyhood and are affected by several factors including sociodemographic [3], physical and psychological conditions of the person [4], economics, culture, religion, the education level of parents, and mass media [5]. These factors may be different between the urban and suburban areas of each

city and province. Gender and age also affect eating habits and food preferences. According to Hodkinson's report [6], the men grow up in a distinctly different way to women, with consequent differing values, ways of looking at life, interest in diet, and knowledge of nutrition. Already-formed eating habits are ingrained and difficult to change, even through the education [7]. Because eating habits are difficult to correct, the students should have, through nutrition education at home and school, well-established and healthy eating habits from the childhood.

Food preference plays a very important role in the formation of undesired eating habits for students [8]. Baxter et al. [9] reported that people took approximately 0.92 times the serving volume for food that they liked, 0.54 times the serving volume for food that they liked nor disliked to, and 0.11 times the serving volume for food they disliked. Thus, the food preference has a quantitative relationship to the amount of food intake, and may greatly affect on nutrient intake [10]. Additionally, Fetzer et al. [11] reported that food preference is one of the main factors affecting the intake of important nutrients, as well as the selection of foods, and is dependent on colors, shapes, tastes, and textures of the food.

For this reason, the serving of school foods without consideration of students' preferences may be a cause of the poor intake of nutrients. Cooking foods that the students prefer may encourage a more consumption of school meal. Also, offering a regular nutrition education and nutritionally balanced meal through the school meal program can help students to obtain a proper knowledge and desire to choose right foods for their health. Due to the difference in eating habits of the various regions, the nutritional problems of a certain community should be primarily identified in order to implement the effective nutrition management of the community.

The aim of this study was to investigate eating habits and food preferences of elementary school students in urban and suburban areas of Daejeon in order to recognize regional differences in eating habits and food preferences. This result may be used for preliminary information in the field of nutrition education, which seeks to improve the health and eating habits of students.

Materials and Methods

Subjects

The study subjects of this study were a group of fourth/fifth grade boys and girls (total of 800 students) in five elementary

schools that implement the school meal service in urban and suburban area of Daejeon. The questionnaire was filled out personally by students under the supervision of a teacher in June 2011. All 800 questionnaires were returned and analyzed statistically.

Contents of investigation and methods

General information of the subject's family and eating habits/food preference was investigated in the study. Questionnaires for general information of the family included the mother's age and educational level, father's occupation, a double-income status, monthly income, and a type of family composition including grandparents' co-residence. Questionnaires for eating habits according to the regions included frequency of eating with family, frequency of unbalanced diet, preference of foods, the eating frequency of snacks before a regular meal, the interest in vegetables, intake of fruit, and eating behavior after the school meal service.

Preference of foods was investigated according to the gender and school grades in urban and suburban areas of Daejeon. The preferred target foods were rice/noodles (18 items), soups (16 items), steamed/hard boiled dishes (12 items), roasted foods/pan-fried dishes (12 items), pan-broiled/fried dishes (18 items), seasoned vegetables/salads (15 items), Kimchi (8 items), fruits (8 items), and other side dishes (8 items) among representative Korean foods [12,13]. Responses of preference against each food were evaluated using a three-point scale: 'liked', 'normal', and 'disliked'. Survey errors, due to the use of various target foods and cooking recipes of many schools, were minimized by classification of cooking recipes using main food ingredient.

Statistical analysis

Survey data were analyzed statistically using the SPSS package program (version 11.0, IBM Inc., Armonk, New York, USA). General information about subjects was evaluated by using frequency analysis. Differences in eating habits and food preference according to the regions were compared using the t-test for continuous variables and cross correlation analysis for non-continuous variables, and were then verified using chi-squared analysis. Statistical significance was considered to be $p < 0.05$.

Results

General information of subjects

Students participating in this survey were 400 boys and

400 girls in the fourth and fifth grade (800 students). General information for the survey subjects is shown in Table 1. Type of family for subjects was investigated; a nuclear family (with only parents and children) was recorded in 85.8% of subjects and an extended family system (with grandparents) in 14.3%. The mothers were aged in their 30s (53.0%) and 40s (44.8%), respectively, and the academic background of the mothers was university graduate in 38.6%, high school graduate in 36.5%, and college graduate in 15.6%. Occupation of the father was salaried men in 51.6%, showing the highest proportion, and the

monthly income was 1.5–2.5 million won in 39.3%, above 3.5 million won in 20.3%, and less than 1.5 million won in 17.9% of subjects.

Eating habits according to residential area

Differences of eating habits were investigated for elementary students in urban and suburban regions (Table 2). Male students' responses for eating frequency of breakfast and oily food showed the different proportion of the responses in urban area and suburban area in a significant difference ($p < 0.05$).

Table 1. General characteristics of the subjects

Characteristics	Criteria	N (%)
Grade	4th grade	400 (50.00)
	5th grade	400 (50.00)
Gender	Male	400 (50.00)
	Female	400 (50.00)
Place of residence	The suburban area	400 (50.00)
	The urban area	400 (50.00)
Family type	Extended family	114 (14.26)
	Nuclear family	686 (85.75)
Employment status of children's parents	All	414 (51.75)
	Father	345 (43.13)
	Mother	25 (3.13)
	Not employed	16 (2.00)
Age of children's mother	Twenties	6 (0.75)
	Thirties	424 (53.00)
	Forties	358 (44.75)
	Fifties	12 (1.50)
Educational background of children's mother	High school	292 (36.50)
	Technical college	125 (15.63)
	College	309 (38.63)
	A postgraduate school	74 (9.25)
Occupation of children's father	Independent enterprise	225 (28.13)
	Salaryman	413 (51.63)
	Civil service	149 (18.63)
	Agriculture and stock-breeding	13 (1.63)
Monthly income (10,000 Won)	<150	143 (17.88)
	150–250	314 (39.25)
	250–350	181 (22.63)
	>350	162 (20.25)
Total		800 (100.00)

Table 2. Eating habits of the subjects by the place of residence

Characteristics	Criteria	Male		Total	X ²	Female		Total	X ²
		Urban	Suburban			Urban	Suburban		
Frequency of eating with family together	Always	94 (47.00)*	85 (42.50)	179 (44.75)		100 (50.00)	96 (48.00)	196 (49.00)	
	Sometimes	100 (50.00)	102 (51.00)	202 (50.50)	3.051	97 (48.50)	101 (50.50)	198 (49.50)	0.162
	Almost not	6 (3.00)	13 (6.50)	19 (4.75)		3 (1.50)	3 (1.50)	6 (1.50)	
Meal time	<10 minutes	36 (18.00)	39 (19.50)	75 (18.75)		26 (13.00)	32 (16.00)	58 (14.50)	
	10–30 minutes	137 (68.50)	139 (69.50)	276 (69.00)	0.645	143 (71.50)	137 (68.50)	280 (70.00)	0.749
	>30 minutes	27 (13.50)	22 (11.00)	49 (12.25)		31 (15.50)	31 (15.50)	62 (15.50)	
Frequency of eating breakfast	Always	155 (77.50)	135 (67.50)	290 (72.50)		143 (71.50)	139 (69.50)	282 (70.50)	
	Sometimes	42 (21.00)	53 (26.50)	95 (23.75)	8.053 [†]	46 (23.00)	51 (25.50)	97 (24.25)	0.362
	Almost not	3 (1.50)	12 (6.00)	15 (3.75)		11 (5.50)	10 (5.00)	21 (5.25)	
Frequency of snacking before taking a meal	Always	11 (5.50)	8 (4.00)	19 (4.75)		10 (5.00)	8 (4.00)	18 (4.50)	
	Sometimes	87 (43.50)	106 (53.00)	193 (48.25)	3.706	111 (55.50)	103 (51.50)	214 (53.50)	1.117
	Almost not	102 (51.00)	86 (43.00)	188 (47.00)		79 (39.50)	89 (44.50)	168 (42.00)	
Kind of main snack	Vegetable/fruit	91 (45.50)	70 (35.00)	161 (40.25)		104 (52.00)	98 (49.00)	202 (50.50)	
	Fastfood	14 (7.00)	18 (9.00)	32 (8.00)	4.635	11 (5.50)	9 (4.50)	20 (5.00)	0.738
	Cookie/beverage	95 (47.50)	112 (56.00)	207 (51.75)		85 (42.50)	93 (46.50)	178 (44.50)	
Frequency of unbalanced diet	Always	91 (45.50)	68 (34.00)	159 (39.75)		111 (55.50)	87 (43.50)	198 (49.50)	
	Sometimes	97 (48.50)	119 (59.50)	216 (54.00)	5.608	79 (39.50)	101 (50.50)	180 (45.00)	5.780
	Almost not	12 (6.00)	13 (6.50)	25 (6.25)		10 (5.00)	12 (6.00)	22 (5.50)	
Frequency of eating 3 types of side dishes or more	Always	135 (67.50)	111 (55.50)	246 (61.50)		124 (62.00)	134 (67.00)	258 (64.50)	
	Sometimes	48 (24.00)	60 (30.00)	108 (27.00)	6.805 [†]	54 (27.00)	49 (24.50)	103 (25.75)	1.271
	Almost not	17 (8.50)	29 (14.50)	46 (11.50)		22 (11.00)	17 (8.50)	39 (9.75)	
Frequency of eating oily food	Frequently	12 (6.00)	26 (13.00)	38 (9.50)		17 (8.50)	19 (9.50)	36 (9.00)	
	Sometimes	179 (89.50)	161 (80.50)	340 (85.00)	6.838 [†]	172 (86.00)	163 (81.50)	335 (83.75)	2.043
	Almost not	9 (4.50)	13 (6.50)	22 (5.50)		11 (5.50)	18 (9.00)	29 (7.25)	
Frequency of eating dairy products	Everyday	94 (47.00)	69 (34.50)	163 (40.75)		104 (52.00)	74 (37.00)	178 (44.50)	
	Sometimes	96 (48.00)	117 (58.50)	213 (53.25)	6.571 [†]	91 (45.50)	109 (54.50)	200 (50.00)	13.222 [†]
	Almost not	10 (5.00)	14 (7.00)	24 (6.00)		5 (2.50)	17 (8.50)	22 (5.50)	
Frequency of eating instant food	Frequently	15 (7.50)	24 (12.00)	39 (9.75)		20 (10.00)	19 (9.50)	39 (9.75)	
	Sometimes	167 (83.50)	159 (79.50)	326 (81.50)	2.302	159 (79.50)	147 (73.50)	306 (76.50)	3.569
	Almost not	18 (9.00)	17 (8.50)	35 (8.75)		21 (10.50)	34 (17.00)	55 (13.75)	
Frequency of eating fruit	Everyday	101 (50.50)	69 (34.50)	170 (42.50)		116 (58.00)	74 (37.00)	190 (47.50)	
	Sometimes	97 (48.50)	129 (64.50)	226 (56.50)	4.635	83 (41.50)	126 (63.00)	209 (52.25)	19.131 [§]
	Almost not	2 (1.00)	2 (1.00)	4 (1.00)		1 (0.50)	(0.00)	1 (0.25)	
Change of meals after school feeding	Reform of an unbalanced diet	43 (21.50)	50 (25.00)	93 (23.25)		60 (30.00)	60 (30.00)	120 (30.00)	
	Decrease of eating between meals	73 (36.50)	75 (37.50)	148 (37.00)	1.063	62 (31.00)	73 (36.50)	135 (33.75)	1.731
	Almost not	84 (42.00)	75 (37.50)	159 (39.75)		78 (39.00)	67 (33.50)	145 (36.25)	

*N(%); [†]Significant difference between students lived in urban and suburban areas by X²-test, p<0.05; [‡]p<0.01; [§]p<0.001.

Responses against the question of frequency of eating three types of side dishes or more had "always" in high proportion in both regions, but the proportion of such response in urban areas was higher in that of suburban areas for male students ($p < 0.05$). Daily consumption of dairy foods was higher in urban areas regardless of gender ($p < 0.05$). Female students' responses for eating frequency of fruit showed the different aspect such as 'every day' in urban area but 'sometimes' in suburban area, in a significant difference ($p < 0.001$). Other responses for eating habits did not show a significant difference according to the residential area.

Male students in urban areas ate breakfast, unbalanced diets, and dairy products more frequently than male students in suburban areas ($p < 0.05$). Although there were male students eating breakfast every day in both urban and suburban areas of Daejeon, the higher proportion for eating breakfast every day was shown in the case of urban regions in a significant difference ($p < 0.05$). However, female students in urban areas more frequently ate dairy products ($p < 0.01$) and fruits ($p < 0.001$) than female students in suburban areas. Additionally, the proportion of female students who consumed dairy foods everyday was higher in urban areas ($p < 0.01$).

Food preferences according to the place of residence

Rice, noodles, and soups

Preferences for rice, noodles, and soups are shown in Table 3. Average preference for bean-mixed rice, red-beans bap, pumpkin gruel, and red-bean gruel scored less than 2.0, and it was evident that the students did not like these. Based on the result comparing the differences by regions, Kimchi fried rice was the most popular food item of students in urban areas (2.7) and suburban areas (2.8), with the students in suburban areas liking Kimchi fried rice more than those in urban areas ($p < 0.05$).

Among the soups, pollack soup scored 1.9, indicating that this menu is far from students' preference. The students liked Galbitang (2.8) the most, and also liked seaweed soup and dumpling soup. Students in urban areas (2.7) liked soybean paste soup more than those in suburban areas (2.6) ($p < 0.01$).

Steamed/hard-boiled dishes, roasted/pan-fried dishes, and pan-broiled/fried dishes

Preferences for steamed/hard-boiled dishes, roasted/pan-fried dishes, pan-broiled/fried dishes are shown in Table 4. In steamed/hard-boiled dishes, hard-boiled lotus root, hard-boiled burdock, and hard-boiled chestnut, bean, and walnut scored less than 2.0 and were not preferred by elementary

students. On the other hand, steamed short ribs scored the highest preference at 2.9 and was found to be the most popular food item in steamed/hard-boiled dishes. In addition, steamed egg gel and beef boiled in soy sauce were preferred by elementary students. In roasted/pan-fried dishes, pan-fried lotus root, grilled wheat cake, and mung-bean pancake scored less than 2.0 points for preference and was not preferred by elementary students. Pan-fried rolled eggs was the most preferred dish, scoring 2.8 points for preference. Preference for steamed/hard-boiled dishes and roasted/pan-fried dishes did not show a regional difference.

Average preference for fried lotus root and fried squash among roasted/fried foods was less than 2.0 and was not preferred by students. Bulgogi, pork cutlet, and deep-fried pork scored more than 2.8 points for preference and were favored by most students. Additionally, fried sausage, Japchae, and fried chicken were preferred by students. Preference for pan-fried cuttlefish was scored 2.6 by students from urban areas and 2.7 by those from suburban areas, thus being shown as a favorite of students from suburban areas ($p < 0.05$).

Seasoned vegetables/salads and Kimchis

Preference for seasoned vegetables/salads and Kimchi are shown in Table 5. Seasoned Saussurea, a mix of cucumber, roots of balloon flower, and seasoned zucchini scored less than 2.0 for preference and was not preferred by students. Fruit punch showed the highest preference, at 2.8 points, and the fruit salads and seasoned bean sprouts had a high preference from students (Table. 5). Preference for seasoned bean sprouts was scored 2.5 by students from urban areas and 2.6 by those from suburban areas, thus shown as being preferred more by students from suburban areas ($p < 0.05$). Preference for Kimchi scored more than 2.0, and cabbage Kimchi was the most preferred by students (2.7). Preference for Altari was scored 2.3 by students from urban areas and 2.4 by those from suburban areas, and was thus shown as preferred more by students from suburban areas ($p < 0.05$).

Fruits and other side dishes

Preference for fruits and other foods are shown in Table 6. Preference for all kinds of fruits scored more than 2.5, and all kinds of fruits were preferred by students. Apples, strawberries, mandarin, and watermelon especially scored above 2.9 for preference. In other side dishes, the preference for Injeolmi and pizza had more than 2.7 preference points.

Table 3. Preferences on rice, noodle, and soup of the subjects by the place of residence

Division	Distribution*			Preference score [†]			
	Dislike	Normal	Like	Total	Urban	Suburban	
Rice & noodle	Rice	11 (1.38)	102 (12.75)	687 (85.88)	2.84 ± 0.39	2.82 ± 0.42	2.86 ± 0.36
	Barley and rice	28 (3.50)	223 (27.88)	549 (68.63)	2.65 ± 0.54	2.66 ± 0.53	2.63 ± 0.55
	Bean-mixed rice	301 (37.63)	271 (33.88)	228 (28.50)	1.90 ± 0.80	1.92 ± 0.82	1.89 ± 0.79
	Mixed five grains	167 (20.88)	271 (33.88)	362 (45.25)	2.24 ± 0.77	2.26 ± 0.78	2.22 ± 0.76
	Red-beans bab	365 (45.63)	262 (32.75)	173 (21.63)	1.76 ± 0.78	1.75 ± 0.76	1.77 ± 0.80
	Jajang bab	36 (4.50)	150 (18.75)	614 (76.75)	2.72 ± 0.53	2.69 ± 0.54	2.74 ± 0.52
	Bibimbab	40 (5.00)	108 (13.50)	652 (81.50)	2.76 ± 0.52	2.73 ± 0.57	2.79 ± 0.47
	Curried rice	54 (6.75)	141 (17.63)	605 (75.63)	2.68 ± 0.59	2.68 ± 0.59	2.69 ± 0.59
	Kimchi fried rice	42 (5.25)	132 (16.50)	626 (78.25)	2.73 ± 0.54	2.68 ± 0.60	2.78 ± 0.48 [‡]
	Spaghetti	55 (6.88)	102 (12.75)	643 (80.38)	2.73 ± 0.57	2.72 ± 0.58	2.75 ± 0.56
	Janchi noodle	52 (6.50)	147 (18.38)	601 (75.13)	2.68 ± 0.58	2.69 ± 0.58	2.67 ± 0.59
	Jajangmyeon	25 (3.13)	99 (12.38)	676 (84.50)	2.81 ± 0.46	2.79 ± 0.49	2.83 ± 0.42
	Naengmyeon	55 (6.88)	121 (15.13)	624 (78.00)	2.71 ± 0.58	2.72 ± 0.56	2.69 ± 0.60
	Ramyeon	30 (3.75)	104 (13.00)	666 (83.25)	2.79 ± 0.48	2.80 ± 0.47	2.78 ± 0.49
	Jjolmyeon	75 (9.38)	167 (20.88)	558 (69.75)	2.60 ± 0.65	2.55 ± 0.68	2.65 ± 0.61
	Chicken gruel	115 (14.38)	222 (27.75)	463 (57.88)	2.43 ± 0.73	2.45 ± 0.71	2.41 ± 0.74
	Pumpkin gruel	285 (35.63)	236 (29.50)	279 (34.88)	1.99 ± 0.84	2.02 ± 0.85	1.96 ± 0.62
	Red-bean gruel	286 (35.75)	249 (31.13)	265 (33.13)	1.97 ± 0.83	1.98 ± 0.81	1.96 ± 0.84
Soup	Seaweed soup	31 (3.88)	141 (17.63)	628 (78.50)	2.74 ± 0.51	2.76 ± 0.49	2.72 ± 0.53
	Dried pollack soup	260 (32.50)	338 (42.25)	202 (25.25)	1.92 ± 0.75	1.92 ± 0.74	1.92 ± 0.77
	Bean sprouts soup	76 (9.50)	222 (27.75)	502 (62.75)	2.53 ± 0.66	2.52 ± 0.66	2.53 ± 0.66
	Soybean paste soup	62 (7.75)	178 (22.25)	560 (70.00)	2.62 ± 0.62	2.67 ± 0.60 [§]	2.57 ± 0.64
	Yukgyejang	85 (10.63)	176 (22.00)	539 (67.38)	2.56 ± 0.67	2.55 ± 0.67	2.57 ± 0.67
	Dumpling soup	36 (4.50)	119 (14.88)	645 (80.63)	2.76 ± 0.52	2.74 ± 0.53	2.77 ± 0.50
	Galbitang	26 (3.25)	91 (11.38)	683 (85.38)	2.82 ± 0.46	2.85 ± 0.40	2.79 ± 0.50
	Frozen pollack pot stew	185 (23.13)	318 (39.75)	297 (37.13)	2.14 ± 0.76	2.11 ± 0.78	2.17 ± 0.74
	Deokkguk	31 (3.88)	108 (13.50)	661 (82.63)	2.78 ± 0.49	2.80 ± 0.48	2.77 ± 0.50
	Fermented soybean soup	242 (30.25)	226 (28.25)	332 (41.50)	2.11 ± 0.84	2.17 ± 0.82	2.05 ± 0.84
	Beef and radish soup	92 (11.50)	211 (26.38)	497 (62.13)	2.50 ± 0.69	2.49 ± 0.72	2.51 ± 0.66
	Beef and seaweed soup	71 (8.88)	163 (20.38)	566 (70.75)	2.61 ± 0.64	2.65 ± 0.63	2.58 ± 0.65
	Eggs and green onion soup	139 (17.38)	264 (33.00)	397 (49.63)	2.32 ± 0.75	2.30 ± 0.76	2.34 ± 0.73
	Potato and pork pot stew	53 (6.63)	139 (17.38)	608 (76.00)	2.69 ± 0.58	2.70 ± 0.57	2.68 ± 0.60
	Weak flake soup	76 (9.50)	163 (20.38)	561 (70.13)	2.60 ± 0.65	2.63 ± 0.64	2.57 ± 0.66
	Soft tofu soup	74 (9.25)	185 (23.13)	541 (67.63)	2.58 ± 0.65	2.59 ± 0.65	2.57 ± 0.65
	Seafood pot stew	84 (10.50)	188 (23.50)	528 (66.00)	2.55 ± 0.67	2.54 ± 0.68	2.57 ± 0.66
	Thick beef soup	106 (13.25)	225 (28.13)	469 (58.63)	2.45 ± 0.71	2.45 ± 0.72	2.45 ± 0.71

*N(%); [†]Mean ± standard deviation, 3=like, 2=normal, 1=dislike; [‡]Significant difference between students lived in urban and suburban areas by independent t-test, p < 0.05; [§]p < 0.01.

Discussion

According to the investigation for family type and the occupation of parents in this study, the proportions of double-income families and nuclear families were approximately 51.8% and 77.1%, respectively. These proportions were much higher than the proportion of double-income families (24.6%) of a metropolitan city in 2007, and were also higher than the proportion of nuclear families (53.7%) [14]. This result reflects the present social situation, which has an increased proportion of nuclear families and double-income families. Increased participation of women in economic activity might be a cause of the reduction of housework functions and the loss of nutrient intake in children of double-income families. Therefore, proper nutrition education is absolutely necessary in the school food

service.

According to the results for differences of eating habits according to the residence of elementary school students in Daejeon, the male students in urban areas ate a regular breakfast ($p < 0.05$), three side dishes ($p < 0.05$), and dairy products and fruits ($p < 0.05$) more frequently than the students in suburban areas. Additionally, the male students in urban areas ate oily foods less than the students in suburban areas ($p < 0.05$). Considering these results, the eating habits of students in same age group were found to be different per urban or suburban residence.

The female students ate more often with the family, as compared with the male students ($p < 0.05$). In the case of snack intake, the girls preferred more vegetables/fruits and

Table 4. Preferences on steamed, hard-boiled, roasted, and fried dish of the subjects by the place of residence

Division	Distribution*			Preference score [†]			
	Dislike	Normal	Like	Total	Urban	Suburban	
Steamed & hard-boiled dish	Steamed short ribs	10 (1.25)	70 (8.75)	720 (90.00)	2.88 ± 0.35	2.89 ± 0.33	2.87 ± 0.37
	Steamed beef shank and rice cakes	151 (18.88)	388 (48.50)	261 (32.63)	2.13 ± 0.70	2.15 ± 0.68	2.12 ± 0.72
	Steamed chicken	59 (7.38)	149 (18.63)	592 (74.00)	2.66 ± 0.60	2.70 ± 0.58	2.63 ± 0.63
	Steamed egg gel	41 (5.13)	122 (15.25)	637 (79.63)	2.74 ± 0.54	2.70 ± 0.57	2.79 ± 0.50
	Beef boiled in soy sauce	35 (4.38)	112 (14.00)	653 (81.63)	2.77 ± 0.51	2.77 ± 0.51	2.77 ± 0.50
	Hard boiled lotus root	279 (34.88)	309 (38.63)	212 (26.50)	1.91 ± 0.77	1.94 ± 0.80	1.89 ± 0.75
	Hard-boiled burdock	318 (39.75)	295 (36.88)	187 (23.38)	1.83 ± 0.77	1.86 ± 0.78	1.81 ± 0.76
	Boiled fish paste in soy	107 (13.38)	188 (23.50)	505 (63.13)	2.49 ± 0.71	2.47 ± 0.73	2.52 ± 0.70
	Boiled potato in soy	79 (9.88)	163 (20.38)	558 (69.75)	2.59 ± 0.66	2.62 ± 0.65	2.57 ± 0.66
	Hard-boiled fish	131 (16.38)	236 (29.50)	433 (54.13)	2.37 ± 0.75	2.35 ± 0.76	2.39 ± 0.73
	Hard-boiled tofu	105 (13.13)	196 (24.50)	499 (62.38)	2.49 ± 0.71	2.49 ± 0.72	2.48 ± 0.70
	Hard-boiled chestnut, beam and walnut	325 (40.63)	306 (38.25)	169 (21.13)	1.80 ± 0.76	1.81 ± 0.74	1.79 ± 0.77
Roasted & pan-fried dish	Roasted fish	105 (13.13)	180 (22.50)	515 (64.38)	2.51 ± 0.71	2.49 ± 0.72	2.52 ± 0.70
	Roasted dried seaweed	55 (6.88)	158 (19.75)	587 (73.38)	2.66 ± 0.60	2.65 ± 0.61	2.68 ± 0.58
	Seafood and green onion pancake	201 (25.13)	269 (33.63)	330 (41.25)	2.16 ± 0.79	2.12 ± 0.80	2.19 ± 0.79
	Pan-fried potato	111 (13.88)	182 (22.75)	507 (63.38)	2.49 ± 0.72	2.49 ± 0.72	2.49 ± 0.73
	Pan-fried lotus root	322 (40.25)	316 (39.50)	162 (20.25)	1.80 ± 0.75	1.81 ± 0.75	1.78 ± 0.74
	Kimchi pancake	73 (9.13)	153 (19.13)	574 (71.75)	2.62 ± 0.64	2.65 ± 0.63	2.59 ± 0.65
	Filletted fish	233 (29.13)	323 (40.38)	244 (30.50)	2.01 ± 0.77	1.99 ± 0.76	2.03 ± 0.78
	Fish stick and egg pancake	112 (14.00)	194 (24.25)	494 (61.75)	2.47 ± 0.72	2.43 ± 0.74	2.52 ± 0.70
	Pan-fried rolled eggs	35 (4.38)	106 (13.25)	659 (82.38)	2.78 ± 0.50	2.77 ± 0.50	2.78 ± 0.51
	Grilled wheat cake	246 (30.75)	341 (42.63)	213 (26.63)	1.95 ± 0.75	1.98 ± 0.75	1.93 ± 0.75
	Mung-bean pancake	287 (35.88)	302 (37.75)	211 (26.38)	1.90 ± 0.78	1.91 ± 0.78	1.89 ± 0.78
	Pan-fried tofu and meatball	226 (28.25)	272 (34.00)	302 (37.75)	2.09 ± 0.80	2.09 ± 0.81	2.09 ± 0.80

Table 4. Continued

Division	Distribution*			Preference score [†]			
	Dislike	Normal	Like	Total	Urban	Suburban	
Pan-broiled & fried dish	Bulgogi	12 (1.50)	65 (8.13)	723 (90.38)	2.88 ± 0.35	2.88 ± 0.36	2.89 ± 0.35
	Pan-broiled cuttlefish	60 (7.50)	147 (18.38)	593 (74.13)	2.66 ± 0.61	2.62 ± 0.64	2.71 ± 0.57 [‡]
	Fried anchovy	86 (10.75)	228 (28.50)	486 (60.75)	2.50 ± 0.68	2.50 ± 0.69	2.49 ± 0.67
	Fried sausage	31 (3.88)	116 (14.50)	653 (81.63)	2.77 ± 0.50	2.75 ± 0.51	2.80 ± 0.48
	Fried seaweed stem	200 (25.00)	247 (30.88)	353 (44.13)	2.19 ± 0.80	2.15 ± 0.81	2.22 ± 0.80
	Fried Kimchi	53 (6.63)	108 (13.50)	639 (79.88)	2.73 ± 0.57	2.70 ± 0.60	2.76 ± 0.53
	Fried pan-broiled octopus with chili pastes	129 (16.13)	179 (22.38)	492 (61.50)	2.45 ± 0.75	2.43 ± 0.76	2.47 ± 0.74
	Fried shredded cuttlefish	111 (13.88)	168 (21.00)	521 (65.13)	2.51 ± 0.72	2.48 ± 0.75	2.54 ± 0.69
	Japchae	52 (6.50)	121 (15.13)	627 (78.38)	2.71 ± 0.57	2.72 ± 0.58	2.71 ± 0.56
	Pork cutlet	12 (1.50)	76 (9.50)	712 (89.00)	2.87 ± 0.37	2.86 ± 0.39	2.89 ± 0.35
	Sugar coated sweet potato	83 (10.38)	157 (19.63)	560 (70.00)	2.59 ± 0.66	2.61 ± 0.67	2.58 ± 0.67
	Fried chicken	46 (5.75)	108 (13.50)	646 (80.75)	2.75 ± 0.55	2.78 ± 0.54	2.71 ± 0.55
	Fried cuttlefish	60 (7.50)	123 (15.38)	617 (77.13)	2.69 ± 0.60	2.68 ± 0.60	2.71 ± 0.59
	Fried shrimp	67 (8.38)	108 (13.50)	625 (78.13)	2.69 ± 0.61	2.65 ± 0.66	2.74 ± 0.56
	Fried lotus root	319 (39.88)	285 (35.63)	196 (24.50)	1.84 ± 0.78	1.83 ± 0.80	1.86 ± 0.76
	Fried squash	291 (36.38)	251 (31.38)	258 (32.25)	1.95 ± 0.82	1.97 ± 0.83	1.94 ± 0.81
	Fried fish ball	214 (26.75)	249 (31.13)	337 (42.13)	2.15 ± 0.81	2.13 ± 0.81	2.17 ± 0.81
	Deep-fried pork	20 (2.50)	74 (9.25)	706 (88.25)	2.85 ± 0.41	2.85 ± 0.42	2.86 ± 0.40

*N(%); [†]Mean ± standard deviation; 3=like, 2=normal, 1=dislike; [‡]Significant difference between students lived in urban and suburban areas by independent t-test, p<0.05.

the boys preferred cookies/beverages, respectively (Table 2, data not shown). Investigation of the eating of balanced meals showed significant differences between the male and female students ($p < 0.05$). Instant foods were consumed more frequently by the male students than the female students ($p < 0.05$), and this difference showed a similarity with the results on the basis of residence ($p < 0.05$).

Shin et al. [15] reported that the eating habit of elementary school students is dependent on residential regions in Seoul. In the study on the dietary life attitude of the male/female high school students in Gyeongju, the preference of the male students for instant food was significantly different from that of the female students [16], which was similar to our result. Although the age of subjects in our study differed slightly from that in previous studies, we can conclude that eating habits depend on the gender or residence. In Park & Koo's study [17] to investigate the eating habits of elementary school students in the Daejeon area, the eating habits of students in higher grades was worse than that of students in the lower grades,

and about 25.8% of children skipped a meal because they did not know what kind of meal they should eat. If a teacher explained the lunch menu, 82.5% of students responded that they would eat lunch. According to the study on the effect of nutrition education methods for 6th grade elementary school students in the Sokcho area [18], the effect of nutrition education using school newsletters was better than children's education groups. Park et al. reported that the on-site training in school was the most effective method for nutrition education [18]. Considering the above results, it appears that the eating habits and eating behaviors of school-age children are affected by the surrounding environment. Therefore, in planning a school meal service, we should consider and plan a specialized meal to suit the students' characteristics and home environment. Because eating habits are formed during the school years, basic education to help with making the right choice against instant foods is necessary. Additionally, because the eating habits were not improved despite the provision of a school meal service, the nutrition education should be more

Table 5. Preference on seasoned vegetable, salad, and Kimchi of the subjects by the place of residence

Division	Distribution*			Preference score [†]			
	Dislike	Normal	Like	Total	Urban	Suburban	
Seasoned vegetable & salad	Seasoned bean sprouts	96 (12.00)	185 (23.13)	519 (64.88)	2.52 ± 0.69	2.46 ± 0.74	2.59 ± 0.64 ^{‡§}
	Seasoned genus saussurea	250 (31.25)	331 (41.38)	219 (27.38)	1.96 ± 0.76	1.95 ± 0.76	1.96 ± 0.76
	Seasoned spinach	198 (24.75)	240 (30.00)	362 (45.25)	2.20 ± 0.81	2.18 ± 0.83	2.22 ± 0.78
	Mixed cucumber and roots of balloon flower	278 (34.75)	300 (37.50)	222 (27.75)	1.93 ± 0.78	1.87 ± 0.77	1.98 ± 0.79
	Acorn-starch jelly	117 (14.63)	181 (22.63)	502 (62.75)	2.48 ± 0.73	2.46 ± 0.77	2.49 ± 0.70
	Mixed green-lentil jelly and dried seaweed	239 (29.88)	278 (34.75)	283 (35.38)	2.05 ± 0.80	2.05 ± 0.82	2.06 ± 0.78
	Seasoned cucumber	164 (20.50)	193 (24.13)	443 (55.38)	2.34 ± 0.79	2.30 ± 0.82	2.39 ± 0.77
	Seasoned zucchini	340 (42.50)	285 (35.63)	175 (21.88)	1.79 ± 0.77	1.78 ± 0.77	1.80 ± 0.78
	Radish salad	248 (31.00)	255 (31.88)	297 (37.13)	2.06 ± 0.82	2.05 ± 0.84	2.07 ± 0.80
	Fruit punch	40 (5.00)	86 (10.75)	674 (84.25)	2.79 ± 0.51	2.78 ± 0.52	2.80 ± 0.50
	Lettuce salad	183 (22.88)	227 (28.38)	390 (48.75)	2.25 ± 0.80	2.24 ± 0.81	2.27 ± 0.79
	Fruit salad	90 (11.25)	106 (13.25)	604 (75.50)	2.64 ± 0.67	2.63 ± 0.68	2.65 ± 0.66
	Macaroni salad	283 (35.38)	224 (28.00)	293 (36.63)	2.01 ± 0.84	2.01 ± 0.85	2.01 ± 0.84
	Kimchi	Sliced white radish Kimchi	69 (8.63)	193 (24.13)	538 (67.25)	2.58 ± 0.64	2.57 ± 0.65
Cabbage Kimchi		43 (5.38)	134 (16.75)	623 (77.88)	2.72 ± 0.55	2.71 ± 0.57	2.73 ± 0.53
Young radish Kimchi		89 (11.13)	166 (20.75)	545 (68.13)	2.57 ± 0.68	2.54 ± 0.69	2.59 ± 0.66
Altari		125 (15.63)	253 (31.63)	422 (52.75)	2.37 ± 0.73	2.32 ± 0.73	2.42 ± 0.73 [†]
Bossam		116 (14.50)	218 (27.25)	466 (58.25)	2.43 ± 0.73	2.42 ± 0.74	2.44 ± 0.72
Watery radish Kimchi		104 (13.00)	180 (22.50)	516 (64.50)	2.51 ± 0.71	2.53 ± 0.71	2.49 ± 0.71
Stuffed cucumber pickles		157 (19.63)	207 (25.88)	436 (54.50)	2.34 ± 0.78	2.36 ± 0.78	2.33 ± 0.79
Sesame leaves pickle		202 (25.25)	201 (25.13)	397 (49.63)	2.24 ± 0.83	2.24 ± 0.82	2.24 ± 0.83

*N(%); [†]Mean ± standard deviation; 3=like, 2=normal, 1=dislike; [‡]Significant difference between students lived in urban and suburban areas by independent t-test, $p < 0.05$.

systematic and continuous, and should take into consideration the gender and regional characteristics of students.

With regards to food preferences of elementary school students for rice, noodles, and soups, white rice was the most favorite and Jajangmyeon was most preferred as a one-dish meal. This result is consistent with Kim et al.'s report [13]. As shown in Table 5, the seasoned vegetables and a one-dish meals had low and high preference by students, respectively. Because food preference is dependent on complex characteristics such as color, texture, taste, and cooking recipe [19], a variety of recipes for improvement of food preference may increase the intake of vegetables for the students. For students, the favorite foods were included in the menu of the school food service, but the mixed five grains rice and some foods had a low preference by students. If mixed five grains rice was

provided as Kimchi-fried rice with finely crushed beans and mixed five grains rice was cooked as Bibimbab, highly preferred meal among the students, the balanced diet including the consumption of food in low preference can be easily encouraged to students. For this reason, the various diet recipes and menus should be developed through a continuous food preference survey.

The students' preference for soup occurred in the following order: Galbitang > Ddeokkguk > dumpling soup > potato and pork pot stew, which is consistent with Kim et al.'s report [13] for food preference of adolescents in the city and local area. Generally, the students liked meat soups. In a preference survey for steamed, hard-boiled, roasted, pan-fried, pan-broiled, and fried dishes, the most preferred menu was meat foods, such as steamed short ribs, steamed egg gel, beef boiled in soy

Table 6. Preferences on fruit and other side dishes of the subjects by the place of residence

Division		Distribution*			Preference score [†]		
		Dislike	Normal	Like	Total	Urban	Suburban
Fruit	Apple	9 (1.13)	28 (3.50)	763 (95.38)	2.94 ± 0.27	2.94 ± 0.27	2.94 ± 0.27
	Pear	24 (3.00)	77 (9.63)	699 (87.38)	2.84 ± 0.43	2.83 ± 0.45	2.85 ± 0.42
	Berry	11 (1.38)	34 (4.25)	755 (94.38)	2.93 ± 0.30	2.92 ± 0.32	2.94 ± 0.28
	Mandarin	6 (0.75)	28 (3.50)	766 (95.75)	2.95 ± 0.25	2.94 ± 0.27	2.95 ± 0.22
	Watermelon	12 (1.50)	44 (5.50)	744 (93.00)	2.91 ± 0.32	2.92 ± 0.31	2.90 ± 0.34
	Banana	25 (3.13)	54 (6.75)	721 (90.13)	2.87 ± 0.41	2.86 ± 0.41	2.87 ± 0.42
	Grape	19 (2.38)	52 (6.50)	729 (91.13)	2.88 ± 0.38	2.89 ± 0.36	2.87 ± 0.40
	A bell tomato	80 (10.00)	80 (10.00)	640 (80.00)	2.70 ± 0.64	2.69 ± 0.64	2.70 ± 0.63
Other side dish	Injeolmi	45 (5.63)	126 (15.75)	629 (78.63)	2.73 ± 0.55	2.73 ± 0.55	2.72 ± 0.56
	Jeolpyeon	89 (11.13)	263 (32.88)	448 (56.00)	2.44 ± 0.68	2.47 ± 0.67	2.42 ± 0.69
	Jeungpyeon	106 (13.25)	297 (37.13)	397 (49.63)	2.36 ± 0.70	2.42 ± 0.67 [‡]	2.30 ± 0.73
	Chaldeok	65 (8.13)	160 (20.00)	575 (71.88)	2.63 ± 0.62	2.66 ± 0.61	2.61 ± 0.64
	Hamburger	58 (7.25)	134 (16.75)	608 (76.00)	2.68 ± 0.60	2.66 ± 0.61	2.70 ± 0.58
	Hotdog	50 (6.25)	152 (19.00)	598 (74.75)	2.68 ± 0.58	2.65 ± 0.58	2.71 ± 0.57
	Peanut cookies	127 (15.88)	245 (30.63)	428 (53.50)	2.37 ± 0.74	2.36 ± 0.72	2.38 ± 0.76
	Piece of pizza	53 (6.63)	131 (16.38)	616 (77.00)	2.70 ± 0.58	2.69 ± 0.57	2.71 ± 0.59

*N(%); [†]Mean ± standard deviation; 3=like, 2=normal, 1=dislike; [‡]Significant difference between students lived in urban and suburban areas by independent t-test, p < 0.05.

sauce, Bulgogi, pork cutlet, deep-fried pork, and fried chicken. This result was consistent with Yoon et al.'s [12] and Kim's report [20] for the food preference of elementary school students in Daegu and Yeungnam, respectively. Koreans consume proteins more than twice value of the recommended intake amount, according to 2009 Korea National Health & Nutrition Examination Survey [21]. Therefore, nutrition education is necessary for a proper intake of nutrients from school age.

Seasoned vegetables had a low preference generally although seasoned bean sprouts had the highest preference among seasoned vegetables, which was consistent with Kim et al. [13] and Yoon et al.'s reports [12]. All kinds of Kimchi had a comparatively high preference by students and cabbage Kimchi was the most favorite Kimchi among students. Fruits had a high preference amongst students and they especially preferred the fruit punch and fruit salads. For Koreans, sodium is the nutrient with the highest intake proportion, as compared with the adequate nutrition intake for school-age children [22]. Because the consumption of Kimchi can increase the sodium intake, a menu with low sodium content, such as radish salad or salads, should be included in the school meal service. Although the elementary school students prefer fruits, in real-

ity, the students did not eat enough fruits due to poor eating habits [12,13]. According to the eating habits of students of urban and suburban areas in this study the proportion of dairy products and fruits eaten every day was higher in students of urban area than in students of suburban area. Therefore, supplying fruits and dairy products in school meal more than twice per week in suburban areas may help the students increase their intake of fresh fruits and dairy products. In addition, the education about the proper selection of snacks will help the formation of healthy eating behavior.

Conclusion

There are distinct differences in eating habits and food preferences according to the location of residence for 4th and 5th grade students in the elementary schools of Daejeon. However, the results in this research can not be generalized for all since the subject of this study was only restricted to 4th and 5th grade school children. Also this study had some limitation such as missing recipes and foods, and classification of recipes according to just main food ingredients for the menu of school meal. Students can access proper nutrient sup-

ply through a well-planned menu which lead the students to actively participate the school meal program. Therefore, the school meals should provide enough nutrients and a realistic menu plan for the physical development and health of students.

Conflict of interest

We declare that we have no conflict of interest.

References

1. Ministry of Education. Special education health division. Seoul: Ministry of Education; 2003.
2. Williams SR, Worthington-Roberts BS. Nutrition throughout the life cycle. St. Louis (MO): Times Mirror/Mosby College Publishing; 1988.
3. Mazur R, Sanders D. Socioeconomic factors associated with child health and nutrition in peri-urban Zimbabwe. *Ecol Food Nutr* 1988;22:19-34.
4. Evans RI, Hall Y. Social-psychologic perspective in motivating changes in eating behavior. *J Am Diet Assoc* 1978;72:378-83.
5. Kim KN. A study on relationship between food habits and personality. *Korean J Nutr* 1982;15:194-201.
6. Hodkinson HM. Diet and maintenance of mental health in the elderly. *Nutr Rev* 1988;46:79-82.
7. Bell AC, Stewart AM, Radford AJ, Cairney PT. A method for describing food beliefs which may predict personal food choice. *J Nutr Educ* 1981;13:22-26.
8. Drewnowski A. Taste preferences and food intake. *Annu Rev Nutr* 1997;17:237-53.
9. Baxter SD, Thompson WO, Davis HC. Fourth-grade children's observed consumption of, and preferences for, school lunch foods. *Nutr Res* 2000;20:439-43.
10. Rozin P. Acquisition of stable food preferences. *Nutr Rev* 1990;48:106-13.
11. Fetzer JN, Solt PF, McKinney S. Typology of food preferences identified by Nutri-Food Sort. *J Am Diet Assoc* 1985;85:961-5.
12. Yoon YO, Lee YS, Kim SM. The dietary behavior and food preference of elementary and high school students in Youngnam areas. *J East Asian Soc Diet Life* 2006;16:13-22.
13. Kim MB, Lee YK, Lee HS. Food behaviors and food preferences of the teenagers in urban, fishing, and rural areas. *J East Asian Soc Diet Life* 1997;7:341-54.
14. Statistics Korea. Society index for Korea. Daejeon: Statistics Korea; 2009.
15. Shin EK, Kim SY, Lee S, Bae I, Lee H. Fast food consumption patterns and eating habits of 6th grade elementary school children in Seoul. *J East Asian Soc Diet Life* 2008;18:662-74.
16. Yoo JE, Park GS. A study of the dietary behavior and food preference of adolescents. *J East Asian Soc Diet Life* 2003;13:19-24.
17. Park CI, Koo NS. Study on food habits of elementary school food service children in Taejeon. *J Korean Diet Assoc* 1998;4:113-22.
18. Park HJ, Lee JS, Kim EK. Assessment of nutrition label education in sixth grade elementary school students. *J Korean Diet Assoc* 2010;16:226-38.
19. Yim KS, Lee TY. Menu analysis of the national school lunch program : the comparisons of the frequency of menu with the students' food preferences. *J Korean Diet Assoc* 1998;4:188-99.
20. Kim YJ. Comparisons of food preference, food habit and dietary attitude of children receiving school food service at elementary school and middle school: in Nam Jeju gun region [MS Thesis]. Gyeongsan: Taegu University; 2000.
21. Ministry of Health and Welfare, Korea Centers for Disease Control and Prevention. Korea Health Statistics 2009: Korea National Health and Nutrition Examination Survey (KNHANES IV-3). Cheongwon: Korea Centers for Disease Control and Prevention; 2010.
22. The Korean Nutrition Society. Dietary reference intakes for Koreans. 1st rev. Seoul: The Korean Nutrition Society; 2010.