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Research Article

Dietary assessment according to frequency of food consumed away from home among children and adolescents: Based on the 2010~2012 Korea National Health and Nutrition Examination Survey

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ABSTRACT

Purpose: The aim of this study was to investigate the dietary quality of food consumed away from home among Korean children and adolescents. **Methods:** Data were obtained from the 2010~2012 KNHANES (Korea National Health and Nutrition Examination Survey) and included 3,583 subjects aged 7 to 18 years old. The frequency of food consumed away from home was dichotomized into more than once or less than once per day. **Results:** Thirty percent of subjects were shown to consume food away from home more than once per day, and older children from higher income households showed a higher frequency of food consumed away from home compared to other children. The percentage of children and adolescents cited as regularly skipping breakfast was 19%. Individuals who ate out more than once per day showed higher consumption of energy and sodium than those who ate out less than once per day. **Conclusion:** Excessive intakes of energy and sodium are associated with obesity, high blood pressure, diabetes, and obesity–related diseases. Thus, there is a need for nutritional intervention and educational efforts to improve child nutrition and prevent obesity.

KEY WORDS: KNHANES, food away from home, dietary assessment, child, adolescent

INTRODUCTION

The consumption of food away from home in Korea has significantly increased over past decades.[1] Contributing factors to increasing frequency of food away from home include reduced average family size, westernized dietary patterns, higher income, and an increasing number of working women.[1-3] In America, the dining-out sector already reached about 25% of total food spending in 1970 with around 40% of food expenditure spent on food obtained away from home.[4] Although the percentage of food expenditure per household in Korea has continuously decreased, the proportion of food budgets spent on food away from home has increased more than 2-fold from 20% in 1990 to 46.6% in 2011.[5] According to reported data from the 2011 Korea National Health and Nutrition Examination Survey (KNHANES), over 25% of respondents consumed away-from-home foods more than once per day.[5,6] For children and adolescents in particular, increased consumption of food away from home may negatively affect nutritional quality of their diets. A number of studies have reported that children who eat out have higher energy intake and lower dietary quality compared with those who do not.[7-9] Lin et al.[4] reported that away-from-home foods consumed by children have higher contents of fat, saturated fat, and sodium and less fiber and calcium than foods from home. A number of studies have shown that the increasing prevalence of childhood obesity is closely related with consumption of food eaten away from home.[4,9] O'Dwyer et al.[10] also examined the contribution of fat to energy as well as the contributions of various food groups consumed at home or away from home to fat in adults from Ireland. They found that the contribution rate of fat to energy was higher than the recommended value for foods consumed away from home, and numerous food groups prepared away from home contributed to fat intake. A study on fast

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food consumption patterns among elementary and high school students of Busan city in Korea reported that consumption frequencies of fast food once or twice per month were 38.5% in elementary and 40.5% in high school students. In addition, this study showed that the reasons for consuming fast food are linked to palatable taste, low price, and convenience.[11] In 2005, the prevalence of obesity in children and adolescents was doubled compared to that in 1997.[12,13] Heo et al.[14] reported that the percentages of obesity among children 2 to 18 yr of age were 13.9% in 2008 and 11.4% in 2009 based on the Korea National Health and Nutrition Examination Survey (KNHANES), whereas percentages were 8.1% in 2008 and 8.2% in 2009 based on the Korean Youth Risk Behavior Web-based Survey (KYRBWS). Childhood obesity is a serious public health problem in developing as well as developed countries.[15] It is associated with various chronic diseases such as diabetes, high blood pressure and cholesterol, and metabolic syndrome. Moreover, these diseases might increase risk of related health problems in adult life.[16] Therefore, the management and prevention of childhood obesity is an important objective of public health. This study aimed to examine the dietary life by frequency of food away from home among children and adolescents aged 7 to 18 yr using data from the 5th (2010~2012) KNHANES.

METHODS

Subjects and data of study

Study data were obtained from the 5th (2010~2012) Korea National Health and Nutrition Examination Survey. Analysis data on 3,583 children aged 7 to 18 yr were selected. Individuals who ate less than 500 kcal or more than 5,000 kcal of daily total caloric intake were excluded by researches regarding Korean adolescents and children of Kwon and Kim[17] and Hernandez et al.[18] Also, all data used in KNHANES were approved by the institutional review board of the Korea Centers for Disease Control and Prevention (2010-02CON-21-C, 2011-02CON-06-C and 2012-01EXP-01-2C).

Consumption of food away from home

We used frequency of away-from-home eating occasions as a variable for analyzing consumption of food away from home. The definition of food away from home in this study was based on the guide[19] for user of KNHANES included commercial foods (delivery foods, take-out foods), institutional food service, offered food from religious community, and others. There are seven categories of away-from-home food frequencies, including "seldom (less than once a month)", "1~3 times per month", "1~2 times per week", "3~4 times per week", "5~6 times per week", "once per day" and "more than twice per day" (excluding "don't know/no response"). Fig. 1 presents the frequency of food consumed away from home among the subjects. The category "5 to 6 times in frequency of food away from home per week" showed the largest percentage (67.9%), followed by "once per day" (17.5%) and "more than twice per day" (12.1%). The others showed less than 1%. Therefore, we regrouped and analyzed two categories of away-from-home foods frequencies as "more than once per day" and "less than once per day".

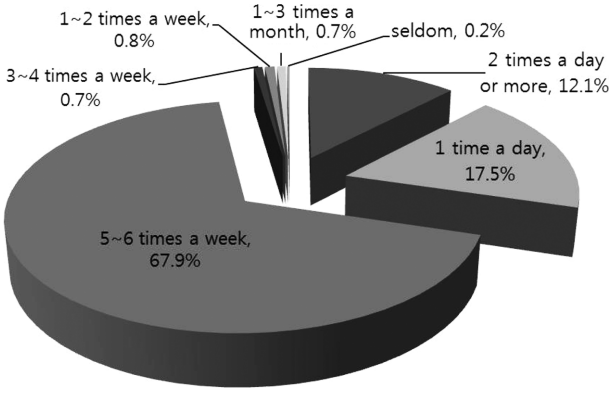

Fig. 1. Frequency of food away from home of children and adolescents

General characteristics

General characteristics data in this study include age, gender, residential area, household income (e.g. high, middle-high, middle-low and low), daily meal pattern (e.g. B + L + D: Breakfast + Lunch + Dinner, B + L: Breakfast + Lunch, B + D: Breakfast + Dinner, L + D: Lunch + Dinner, B or L or D). Snack consumption reclassified variable of daily meal from the guideline[19] for KNHANES. Meanwhile, weight status was categorized four groups (e.g. underweight: BMI < 5th, normal: 85th ≥ BMI > 5th, overweight: 95th ≥ BMI > 85th, and obesity: BMI > 95th) based on the previous study.[20,21] Analysis was conducted for three age groups; 7 to 12 yr, 13 to 15 yr, and 16 to 18 yr. Residential area was classified into two categories: city and

rural area. The variable of Food Insecurity was assessed by a self-reported hunger measure on the dietary situation of subjects' households in the previous year based on the KNHANES data and regarded as household food security status of subject. Based on the previous studies,[22,23] we classified four groups of food security status which are enough food secure group as 'enough and various food to eat for all family members, mildly food insecure group as 'enough amount of food but insufficient variety of food', moderately food insecure group as 'sometimes unable to acquire enough food to eat because of insufficient money', and severely food insecure group as 'often not enough food to eat because of insufficient money'.

Intake of food and nutrition

Food and nutrient intakes of this study were analyzed by using the 24-h recall method. Items of food intake were categorized based on the variables of classification for 18 food intakes (e.g. total food, cereals and grain products, potatoes and starches, sugars and sweets, legumes and their products, seeds and nuts, vegetable (including kimchi and fermented vegetables), mushrooms, fruits, meat, poultry and their products, eggs, fish and shell fish, seaweeds, milk and dairy products, oils and fats, beverages, seasonings, other foods) using the food code and method by studies of Bae and Yeon[24] and Kwon and Kim.[17] In addition to the amount of nutrient intake, we measured an individual's intakes of calories, macronutrient, and sodium per day. For analysis, we also calculated the percentage of carbohydrates, fat and proteins contributing to energy at the individual level.

Statistical analysis

This survey was conducted on a nationally representative estimate of the Korean population based on a multistage stratified cluster sampling method. Statistical analysis was performed with stratified sampling weights using the SAS software (version 9.3; SAS Institute, Cary, NC, USA). Analysis generated results shown as the weighted % by the proc surveyfreq procedure. For categorical variables, their means were calculated after adjusting such as residential area and household income by the proc surveyreg procedure. Additionally, to analyze the frequency of food consumption away from home more than once or less than once per day, frequency of food consumption away from home was reclassified as "1" for "more than once of frequency of food away from home per day" and "0" for "less than once of frequency of food away from home per day". Based on these data, logistic regression analysis and the odd ratio (ORs) were obtained.

RESULTS

Comparison of frequency of food consumed away from home by general characteristics

The general characteristics of subjects were shown in Table 1. From a total of 3,583 children, 53.2% of subjects were boys, and those aged 7 to 12 yr constituted 44.9%. The percentage of individuals living in a city was higher than rural areas. Approximately 80% of subjects were of normal body weight, whereas underweight were 3.8% and obesity were 5.4%. And overweight was 9.9%. The analysis between general characteristics and the frequency of food away from home showed as follows. More than half of adolescents aged 16 to 18 yr consumed away-from-home foods more than one time per day (52.7%), followed by 25.1% of children aged 13 to 15 yr and 22.2% of children aged 7 to 12 yr ($p < 0.0001$). Gender, residential area, family size, weight status and household income did not influence the frequency of food consumed away from home.

Comparison of frequency of food consumed away from home by dietary habits

The frequency of food consumed away from home by dietary habits of subjects was shown in Table 2. Regarding daily meal patterns from 24-h recall data, 69.7% of subjects ate three meals per day (B + L + D), whereas 19% skipped breakfast and only ate lunch and dinner (L + D). With daily meal patterns by frequency of food consumed away from home, the ratio of three meals per day (B + L + D) in group of < 1/day eating-out frequency showed approximately 10% lower than that in ≥ 1/day eating-out frequency. The majority of subjects (94.2%) consumed snacks. With the household food insecurity status, the group of mildly food insecure showed more than 50% independently of eating-out frequency, and the group of enough food secure was also 40~45% independently of eating-out frequency.

Nutrient intakes for total and gender group by the frequency of food away from home

Food and nutrient intakes for children aged 7 to 18 yr by

Table 1. Comparison with frequency of food away from home by general characteristics

Variables	Total (n = 3,583)		Frequency of food away from home				p-value[2]
			< 1/day (n = 2,678)		≧ 1/day (n = 905)		
	n	%[1]	n	%	n	%	
Age (yr)							
Average age (Mean ± SE)	12.9 ± 0.1		12.1 ± 0.1		14.7 ± 0.1		< 0.0001[3]
7 ~ 12 yr (Elementary school age)	2,022	44.9	1,724	54.5	298	22.2	
13 ~ 15 yr (Middle school age)	911	27.2	684	28.1	227	25.1	< 0.0001
16 ~ 18 yr (High school age)	650	27.9	270	17.4	380	52.7	
Gender							
Boy	1,890	53.2	1,398	52.4	492	55.2	0.1994
Girl	1,693	46.8	1,280	47.6	413	44.8	
Residential area							
City	3,075	82.5	2,299	83.2	776	81.0	0.3724
Rural area	508	17.5	379	16.8	129	19.0	
Household income level[4]							
Low	366	13.7	284	14.7	82	11.5	
Middle-low	945	30.4	730	31.2	215	28.4	0.0863
Middle-high	1,145	29.7	860	29.1	285	31.1	
High	1,084	26.2	771	25.0	313	29.0	
Family size							
2	88	3.3	59	3.1	29	4.0	
3	565	17.3	409	17.0	156	18.2	0.6894
4	1,860	48.6	1,388	48.3	472	49.2	
5	785	22.2	602	22.8	183	20.7	
≧ 6	281	8.6	217	8.9	64	7.9	
Average (Mean ± SE)	4.2 ± 0.1		4.2 ± 0.04		4.3 ± 0.2		0.5585[3]
Weight status							
Underweight (BMI < 5th)	112	3.8	90	4.3	22	2.7	
Normal (5th ≦ BMI < 85th)	2,434	80.9	1,805	79.7	629	83.7	0.1167
Overweight (85th ≦ BMI < 95th)	307	9.9	220	10.1	87	9.6	
Obesity (BMI ≧ 95th)	171	5.4	136	5.9	35	4.0	

1) Weighted% 2) p-value by chi-square 3) p-value by t-test 4) Household income level was categorized using the reference of Korea health statistics by the Korea Centers for Disease Control and Prevention.

Table 2. Comparison with frequency of food away from home by dietary habit

Variables	Total (n = 3,583)		Frequency of food away from home				p-value[2]
			< 1/day (n = 2,678)		≧ 1/day (n = 905)		
	n	%[1]	n	%	n	%	
Daily meal pattern[3]							
B + L + D	2,673	69.7	2,056	72.2	617	63.9	
B + L	116	3.0	80	2.5	36	4.1	<.0001
B + D	119	4.2	93	4.8	26	2.7	
L + D	579	19.0	391	16.9	188	23.9	
B or L or D	96	4.1	58	3.6	38	5.4	
Average frequency of daily meal (Mean ± SE)	2.7 ± 0.01		2.7 ± 0.01		2.6 ± 0.03		0.0016[4]
Snack consumption							
Yes	3,403	94.2	2,553	94.3	850	93.9	0.6951
No	180	5.8	125	5.7	55	6.1	
Food insecurity status							
Enough food secure	1,614	42.7	1,204	42.0	410	44.4	
Mildly food insecure	1,874	54.0	1,402	54.6	472	52.4	0.0692
Moderate food insecure	74	2.7	54	2.5	20	3.1	
Severely food insecure	19	0.6	17	0.9	2	0.1	

1) Weighted % 2) p-value by chi-square 3) B: breakfast, L: lunch, D: dinner 4) p-value by t-test

Table 3. Food and nutrient intake in eating-out frequency by total and gender[1)]

Variables	Total		Frequency of food away from home				p-value
			≧ 1/day		< 1/day		
	Mean	SE	Mean	SE	Mean	SE	
Total (n = 3,583)			n = 906		n = 2,681		
Energy (kcal/day)	2,077.7	18.5	2,224.0	34.4	2,014.6	19.7	< 0.0001
Carbohydrate (g/day)	322.8	2.8	343.5	5.5	315.8	3.1	< 0.0001
Protein (g/day)	74.5	0.9	79.9	1.9	72.2	1.0	< 0.0001
Fat (g/day)	54.3	0.8	58.6	1.4	51.5	0.8	< 0.0001
Sodium (mg/day)	3,934.0	57.8	4,409.0	132.1	3,767.3	53.9	< 0.0001
Energy contribution (%)							
Carbohydrate	63.2	0.2	62.6	0.5	63.6	0.3	0.0728
Protein	14.2	0.1	14.2	0.2	14.2	0.1	0.9351
Fat	22.6	0.2	23.1	0.4	22.2	0.2	0.0286
Boy (n = 1,984)			n = 493		n = 1,401		
Energy (kcal/day)	2,273.0	25.9	2,496.8	50.3	1,887.4	44.9	< 0.0001
Carbohydrate (g/day)	352.3	3.9	383.6	7.6	294.0	7.2	< 0.0001
Protein (g/day)	82.5	1.3	91.2	2.7	65.9	2.0	< 0.0001
Fat (g/day)	58.8	1.1	65.6	2.1	50.0	2.0	< 0.0001
Sodium (mg/day)	4,354.9	74.1	4,997.2	165.6	3,683.2	167.5	< 0.0001
Energy contribution (%)							
Carbohydrate	63.1	0.3	62.4	0.6	62.9	0.7	0.1379
Protein	14.4	0.1	14.5	0.2	13.9	0.2	0.6621
Fat	22.5	0.3	23.1	0.5	23.2	0.6	0.1146
Girl (n = 1,693)			n = 413		n = 1,280		
Energy (kcal/day)	1,852.8	22.3	2,173.8	27.4	1,839.0	24.6	0.3428
Carbohydrate (g/day)	291.7	3.4	338.5	4.2	290.8	4.0	0.7041
Protein (g/day)	65.3	1.1	78.7	1.3	65.0	1.2	0.7011
Fat (g/day)	47.7	1.0	55.8	1.2	46.8	1.0	0.1294
Sodium (mg/day)	3,504.0	72.6	4,070.2	70.4	3,433.0	68.6	0.1582
Energy contribution (%)							
Carbohydrate	63.5	0.3	63.4	0.3	63.8	0.4	0.2494
Protein	14.0	0.1	14.3	0.1	14.1	0.1	0.4862
Fat	22.5	0.3	22.2	0.3	22.2	0.3	0.0996

1) Adjusted for region area, household income 2) (Each food intake/total food intake) * 100

number of eating-out frequency were analyzed in Table 3. As with the total subjects, all nutrient intake and energy contribution rate of carbohydrate and protein were significantly different between the subjects with more than once and those with less than once frequency of eating-out ($p < 0.05$). For boy group, all nutrient intake and energy contribution were also shown a significant difference between more than once and less than once eating-out frequency groups ($p < 0.0001$). Especially, total energy intake of boys who ate out more than once a day was markedly higher than those of less eating out. According to the dietary guidelines of World Health Organization (WHO), sodium intake should be limited to no more than 2,000 mg per day.[25] However, sodium intake of total subjects was shown more than twice than the level of recommendation as 4,409 mg/day. Consumption of sodium is more severe for boys as 4,997.2 mg/day than girls.

Nutrient intakes for age groups by the frequency of food away from home

Table 4 showed nutrient intakes regarding eating-out frequency by ages. For children aged 7 to 12 yr old, the intakes of nutrient and energy contribution ratio of three main nutrients (carbohydrate, protein, and fat) differed

Table 4. Food and nutrient intake in eating-out frequency by age[1)]

Variables	Total		Frequency of food away from home				p-value
			≧ 1/day		< 1/day		
	Mean	SE	Mean	SE	Mean	SE	
7 ~ 12 (Elementary school age, n = 2,023)			n = 298		n = 1,725		
Energy (kcal/day)	1,919.6	20.2	2,062.7	44.4	1,895.0	21.7	0.0009
Carbohydrate (g/day)	305.8	3.2	325.0	6.3	302.5	3.5	0.0019
Protein (g/day)	67.6	0.9	74.3	2.7	66.4	1.0	0.0070
Fat (g/day)	47.7	0.8	52.4	2.2	46.9	0.8	0.0209
Sodium (mg/day)	3,495.3	56.9	3,818.0	159.0	3,439.9	57.4	0.0252
Energy contribution							
Carbohydrate ratio	64.4	0.3	63.8	0.7	64.5	0.3	0.3521
Protein ratio	14.0	0.1	14.2	0.3	14.0	0.1	0.4479
Fat ratio	21.6	0.2	22.0	0.6	21.5	0.3	0.4356
13 ~ 15 (Middle school age, n = 913)			n = 228		n = 685		
Energy (kcal/day)	2,175.0	32.5	2,208.4	67.3	2,162.4	37.9	0.5582
Carbohydrate (g/day)	341.5	5.6	351.9	10.7	337.6	6.5	0.2492
Protein (g/day)	77.1	1.5	76.1	3.0	77.5	1.7	0.6816
Fat (g/day)	55.6	1.2	55.4	2.2	55.6	1.5	0.9200
Sodium (mg/day)	4,171.9	92.8	4,306.2	186.8	4,121.2	107.1	0.3930
Energy contribution							
Carbohydrate ratio	63.5	0.4	64.1	0.6	63.3	0.5	0.2814
Protein ratio	14.1	0.1	13.6	0.3	14.2	0.2	0.0354
Fat ratio	22.4	0.4	22.3	0.6	22.5	0.4	0.7424
16 ~ 18 (High school age, n = 651)			n = 380		n = 271		
Energy (kcal/day)	2,233.7	40.3	2,299.5	52.9	2,150.2	60.2	0.0600
Carbohydrate (g/day)	336.2	6.1	347.3	8.4	322.1	8.6	0.0351
Protein (g/day)	82.9	2.2	84.0	2.8	81.5	3.3	0.5502
Fat (g/day)	61.2	1.8	62.9	2.3	59.1	2.7	0.2886
Sodium (mg/day)	4,491.9	128.1	4,707.3	192.6	4,218.5	153.8	0.0494
Energy contribution							
Carbohydrate ratio	61.4	0.5	61.5	0.7	61.3	0.7	0.8229
Protein ratio	14.7	0.2	14.5	0.3	15.0	0.3	0.1926
Fat ratio	23.9	0.4	24.0	0.6	23.7	0.6	0.7258

1) Adjusted for region area, household income 2) (Each food intake/total food intake) * 100

significantly between more than once and less than once eating-out frequency groups of children 7 to 12 yr ($p < 0.05$). As with adolescents aged 16 to 18 yr, the intakes of carbohydrate and sodium differed significantly between more than once and less than once eating-out frequency groups ($p < 0.05$). For all ages, sodium intakes for the more than once per day eating-out frequency were significantly higher as 3,818 mg/day of children 7 to 12, 4,306 mg/day of adolescents 13 to 15, and 4,707 mg/day of adolescents 16 to 18 yr, respectively, compared with those for the less than once a day eating-out groups. For adolescents aged 16 to 18 yr, individuals who ate out more than once per day reported highest sodium consumption (4,707.3 mg/day) and fat ratio for energy contribution (24%) among three age groups.

Food intakes according to frequency of food away from home

Food intakes in children and adolescents aged 7 to 18 yr by eating-out frequency were shown in Table 5. Total food intakes of the subjects with ≥ 1/day eating-out frequency were approximately 150 g higher than those of < 1/day eating-out frequency, while it was not significantly different after adjusting gender, age, and energy intake (crude p-value < 0.0001, adjusted p-value = 0.2203). For the crude means of 'Cereals and grain products', 'Meat, poultry and their products', 'Oils and fats', 'Beverages', 'Seasonings', the subjects with ≥ 1/day eating-out frequency

Table 5. Food intake according to frequency of food away from home

Variables	Total (n = 3,583)		Frequency of food away from home				Crude p-value[1)]	Adjusted p-value[2)]
			< 1/day (n = 2,,678)		≧ 1/day (n = 905)			
	Mean	SE	Mean	SE	Mean	SE		
Total food (g/day)	1,328.7	16.4	1,283.7	16.2	1,435.4	29.6	< .0001	0.2203
Cereals and grain products (g/day)	331.2	3.5	325.7	3.9	344.3	6.6	0.0137	0.8738
Potatoes and starches (g/day)	31.6	1.8	29.8	1.8	36.0	3.8	0.1216	0.6203
Sugars and sweets (g/day)	11.9	0.8	11.4	0.9	13.3	1.2	0.1633	0.6052
Legumes and their products (g/day)	28.1	1.3	27.9	1.4	28.7	2.8	0.7799	0.5240
Seeds and nuts (g/day)	2.2	0.3	2.0	0.2	2.7	0.8	0.3908	0.6718
Vegetable (g/day)	192.8	3.6	189.4	4.1	200.8	6.5	0.1250	0.0722
Mushrooms (g/day)	4.7	0.3	4.9	0.4	4.2	0.4	0.2428	0.0814
Fruits (g/day)	143.4	6.2	139.2	6.0	153.6	12.3	0.2466	0.1359
Meat, poultry and their products (g/day)	128.0	4.3	121.8	4.6	142.9	7.8	0.0109	0.2266
Eggs (g/day)	32.3	1.0	32.3	1.2	32.1	1.8	0.9293	0.1239
Fishes and shell fishes (g/day)	35.0	1.3	33.2	1.2	39.1	3.0	0.0626	0.2730
Seaweeds (g/day)	3.2	0.3	3.1	0.3	3.6	0.6	0.3042	0.2212
Milks and dairy products (g/day)	198.9	5.0	203.1	5.6	188.8	9.0	0.1552	0.5030
Oils and fats (g/day)	8.1	0.3	7.5	0.2	9.5	0.5	0.0002	0.3550
Beverages (g/day)	137.3	7.3	113.6	7.0	193.5	15.4	< .0001	0.1071
Seasonings (g/day)	31.4	0.9	29.8	1.1	35.1	1.6	0.0052	0.7810
Other food (g/day)	8.7	1.1	9.4	1.5	7.2	1.2	0.2822	0.1688

1) All p-value were calculated using regression analysis. 2) All food intakes were adjusted for gender, age, and energy intake.

Table 6. Factors related to frequency of food away from home

Variables	Odd ratio (95% CI, Confidence Interval)	p-value[1)]
Gender (Ref. = boy)		
Girl	0.866 (0.698 ~ 1.074)	0.1898
Age (Ref. = 7 ~ 12 yr, elementary school age)		
13 ~ 15 yr (Middle school age)	2.234 (1.722 ~ 2.898)	< 0.0001
16 ~ 18 yr (High school age)	7.186 (5.410 ~ 9.546)	< 0.0001
Region (Ref. = city)		
Rural area	1.153 (0.794 ~ 1.675)	0.4537
Household income (Ref. = low)		
Middle-low	1.097 (0.704 ~ 1.708)	0.6821
Middle-high	1.435 (0.928 ~ 2.220)	0.1046
High	1.404 (0.907 ~ 2.175)	0.1281
Weight status (Ref. = normal)		
Underweight	0.587 (0.291 ~ 1.182)	0.1357
Overweight	0.944 (0.643 ~ 1.388)	0.7704
Obesity	0.587 (0.360 ~ 0.957)	0.0328
Daily meal pattern (Ref. = B + L + D)		
B + L	2.034 (1.014 ~ 4.080)	0.0455
B + D	0.466 (0.247 ~ 0.881)	0.0188
L + D	1.263 (0.941 ~ 1.694)	0.1202
B or L or D	1.173 (0.619 ~ 2.226)	0.6244
Snack consumption (Ref. = yes)		
No	0.906 (0.533 ~ 1.541)	0.7165
Food insecurity status (Ref. = enough food secure)		
Mildly food insecure	0.869 (0.675 ~ 1.119)	0.2757
Moderate food insufficient	1.223 (0.528 ~ 2.831)	0.6381
Severely food insufficient	0.094 (0.010 ~ 0.935)	0.0437

1) Adjusted for energy intake

were significantly higher intakes than the others (crude p-value < 0.05), while there was not significantly different after adjusting gender, age, and energy intake. The other foods were not shown significant differences by eating-out frequency.

Factors related to frequency of food away from home (≥ 1/day)

Analysis of factors related to frequency of food away from home (≥ 1/day) was presented in Table 6. Overall individuals who ate out more than once per day were differed significantly by age, daily meal pattern (B + L, B + D), food insecurity status (Severely food insufficient) and weight status (Obesity) ($p < 0.05$). With increasing age, adolescents aged 13 to 15 as well as 16 to 18 yr showed 2.2 times (OR = 2.234) and 7.2 times (OR = 7.186) increased frequencies of eating-out more than once per day, respectively, compared to children aged 7 to 12 yr. For weight status, individuals with obesity showed a decreased frequency of food consumed away home of 41.3% (OR = 0.587) when they ate out more than once per day. With daily meal pattern, individuals who ate out more than once per day showed 2.0 times (OR = 2.034) increase in B + L and 53.4% (OR = 0.466) decrease in B + D compared to B + L + D of daily meal pattern. Likewise, for food insecurity status, severely food insufficient group showed approxi-

mately 90.6% (OR = 0.094) decreased frequencies of food away from home compared to enough food secure group.

DISCUSSION

This study examined the consumption of food away from home as well as food and nutrient intakes of children and adolescents aged 7 to 18 yr based on the 5th (2010~2012) KNHANES. To accomplish this study, the subjects were classified two groups which were < 1/day eating-out frequency and ≥ 1/day eating-out frequency groups. With increasing age, the ratio of subjects who ate out more than once per day increased. On the contrary, the previous studies based on the adults aged over 19 [6,26,27] reported that the younger people consumed food away from home more than the older age people did. These results were thought that the consumption rate of food away from home increased with getting older from children to adolescents and this leads to increase that of food away from home in the twenties.

This study showed that the percentage of children and adolescents who skipped breakfast showed 19%. Individuals who ate out more than once per day showed higher consumption of energy and sodium than those who ate out less than once per day. Although individuals who ate three meals per day still constituted the highest percentage of subjects, the percentage of children and adolescents who skipped breakfast was fairly high (19%). Yeoh et al.[21] reported that 17% of 1,600 children aged 7 to 18 yr skipped breakfast based on data from the 2001 National Health and Nutrition Survey. They also found that the rate of skipping breakfast in older children was higher than that in younger ones. The reasons for skipping breakfast were mainly associated with time constraints and not feeling hungry in the morning.[28] Intake of an "adequate" breakfast, especially for adolescents, is a very important contributor to physical and mental growth as well as academic achievement.[21,29,30] Several studies in children and adolescents showed that individuals who regularly skipped breakfast are associated with obesity development.[31-34] Since skipping breakfast is an important contributor to higher levels of hunger later, it can lead to overconsumption of high fat and energy-dense foods.[35,36]

In the result of this study, the percentage of individuals who consumed snacks was 94.2%. In the United States, the number of snacks consumed in adolescents 12 to 18 yr increased from 1.6 per day in 1977 to 1.97 snacks in 1996.[37,38] For nutrient quality of snacks, calcium density decreased while energy density and energy percentage from fat increased compared with non-snacking occasions.[37] In this study, approximately 70% of children ate out five to six times per week, followed by 17.5% who ate out once per day and 12.1% who ate out twice per day. A study from 2003 analyzed the eating-out behavior patterns of 1,487 adolescents aged 15 and 17 yr. Regarding frequency of eating-out, 62.7% of respondents reported a frequency of one to two times per week, whereas 3.5% reported a frequency of more than five times per week.[39] This result shows that the frequency of away-from-home eating dramatically increased in children and adolescents from 2003 to 2012. Regarding frequency of eating-out among age groups, the percentage of adolescents aged 16 to 18 yr who ate out more than once per day was 55.9%, followed by 27.4% in adolescents aged 13 to 15 yr and 14.7% in children aged 7 to 12 yr. This result demonstrates that older adolescents ate out more frequently than younger children. These results have been thought to come from various factors, including increased time spent outside home for school and private educational institutes, more social gatherings with peers, and increased access to fast food outlets and restaurants.

Kim et al.[40] examined trends in consumption of unhealthy foods by socioeconomic position and determined the effects of the government's nutritional policies among adolescents. They observed an apparent decline in unhealthy food intakes according to the nutritional polices the government implemented. The subjects who ate out more than once per day were significantly associated with higher total and plant food intakes than those who ate out less than once per day. Regarding nutrient intakes, the more frequent eating-out group was associated with higher energy, carbohydrate, protein, fat, and sodium intakes than the other group. Some data from the United States Department of Agriculture (USDA) also suggested that away-from-home foods may contain higher energy and fat contents than foods from home.[4] Especially, boys who consumed more food away from home had the highest caloric intake among all groups. Although children and adolescents need high energy and nutrient intakes for growth and development compared with other age groups, imbalance between energy intake and energy expenditure in relation to away-from-home foods may contribute to obesity development and chronic

nutrition-related diseases.[38] Kleiser et al.[41] suggested that high intakes of energy-dense foods and beverages are significantly associated with overweight and obesity status among children and adolescents. A comparison of nutritional quality between foods at home versus away from home in 1977~2008 determined an increase in intake of away-from-home foods from 17.7% in 1977~78 to 31.6% in 2005.[42] The World Health Organization (WHO) recommends that sodium intake not exceed 2,000 mg per day.[25] However, children and adolescents in this study consumed an average of 3,934.0 mg per day, which is almost two times higher than the recommended limit. All subjects who ate out more than once per day showed considerably higher sodium intakes compared to those who ate out less than once per day. Food prepared away home is an important contributor to overconsumption of sodium. Lin et al.[4] found that males aged 12 to 39 yr had higher sodium intake than females since they tended to eat more than women. They also observed that foods consumed from restaurants had higher densities of cholesterol and sodium than those from fast food outlets and school. Lin et al.[42] reported that Americans 2 yr of age and older had an average sodium intake per day of 3,085 mg during 2005~2008, compared with the recommended limit of less than 2,300 mg/day. The USDA[42] reported that food prepared away from home constitutes 41% of food spending and 32% of caloric intake in 2008. Food away from home has become a regular dietary behavior for most Koreans due to the prevalence of two-earner households, more single households and more restaurants and fast-food establishments. Increased consumption of food away from home has increased caloric intake and lowered nutritional quality in both adults and children.[38,43] Unhealthy dietary patterns and overconsumption of foods away from home, low meal frequency, skipping breakfast, and consumption of more sugar-sweetened beverages in children and adolescents might be associated with obesity development and chronic nutrition-related diseases.[38] Meanwhile, 24-h dietary recalls based on 1-day recall data are generally conducted through in-person interviews by trained dietary staff. A single measurement in a 24-h dietary recall survey cannot account for day-to-day and within-person variations nor represent general dietary patterns of the subjects.[44,45] Nevertheless, use of a single 24-h recall for measurements could be generalized to the Korean population to analyze average intake in a large nationally representative sample.[45] Mancino et al.[16] reported that older children consume 50% more food prepared outside the home than younger ones. Our findings also show that individuals aged 16 to 18 yr who ate out more than once per day consumed more total food and nutrients among all age groups. This result shows that older children and adolescents typically have more chances to make their own food choices than younger children since they can spend money on their own, have more time with friends, and have more freedom.[16]

Based on the findings of this study, 30% of school-aged children and adolescents consumed food away from home more than once per day, and older children from higher income households more frequently ate out than other children. Individuals who ate out more than once per day showed higher consumption of energy and sodium than those who ate out less than once per day. Excessive intake of energy and sodium are associated with obesity, high blood pressure, diabetes, and obesity-related diseases, suggesting education is needed to improve child nutrition and prevent obesity.

This study has some limitations. First, the KNHANES only surveyed limited socio-demographic variables. Therefore, comparative analysis of various demographic, lifestyle, and behavioral variables was not conducted. Second, we could not include institutional and commercial results in eating-out frequency since eating-out frequency in the KNHANES data did not include institutional foodservice or commercial eating-out. Therefore, addition of diverse eating-out materials to the KNHANES is necessary for future research.

SUMMARY

This study was to investigate the dietary quality of food away from home among Korean children and adolescents. Thirty percent of subjects were shown to consume food away from home more than once per day, and 7~18 children and adolescents in Korea from higher income households showed a higher frequency of food away from home compared to other children. The percentage of children and adolescents cited as regularly skipping breakfast showed 19%. Individuals who ate out more than once per day resulted in higher consumption of energy and sodium than those who ate out less than once per day. For children aged 7 to 12 yr old, the intakes of nutrient and energy contribution ratio of three main nutrients

(carbohydrate, protein, and fat) differed significantly between more than once and less than once eating-out frequency groups of children 7 to 12 yr. As with adolescents aged 16 to 18 yr, the intakes of carbohydrate and sodium differed significantly between significantly between more than once and less than once eating-out frequency groups. The subjects who ate out more than once per day showed higher consumption of energy and sodium than those who ate out less than once per day. Based on these results, excessive intakes of energy and sodium are associated with obesity, high blood pressure, diabetes, and obesity-related diseases. Thus, there is a need for nutritional intervention and educational efforts to improve child nutrition and prevent obesity.

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