

## Korean Female Adolescents' Food Attitudes and Food Intake Relative to the Korean Food Tower (I) : Food Intake

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### ABSTRACT

A survey was conducted to examine the food intake of 285 Korean female students attending a secondary school in Seoul. Food intake was assessed using a food frequency based on the Korean Food Tower which consists of five food groups, i.e., grain products, vegetables and fruits, meat, milk, and fats and sweets. To describe food intake descriptive statistics were obtained using SPSS. The food frequency analysis indicated that the participants ate rice, cabbage kimchi, radish, and soybean/red pepper paste most frequently along with milk, ice cream, tea, and seasonal fruits such as citrus fruits, apples, watermelon, and grapes for snacks. Distributions of the total standardized serving frequency for each food group indicated that approximately 84, 83, 45, 60, and 34%, respectively, of the respondents met the recommended serving frequency for grain products, vegetables and fruits, meat, milk, and fats and sweets groups (mean servings per day 5.5, 10.6, 5.5, 2.1, 3.5). Income was the only demographic factor that affected food intake, particularly with respect to meat, milk, and fats and sweets ( $p < .01$ ). In Korea, these food groups are generally more expensive than the other ones. (*J Community Nutrition* 4(3) : 164~179, 2002)

**KEY WORDS :** korean female adolescents · food intake · food frequency · korean food tower.

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### Introduction

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There is no school lunch program for secondary school students in Korea. Most of the students carry lunch boxes. At times, they carry two lunch boxes : one for lunch, the other for dinner. Some of the students have lunch in the snack bar operated by the school or eat lunch and/or dinner in fast food restaurants near the school (Ko et al. 1991). They may eat nutritionally unbalanced lunches and/or dinners. In addition, some students skip breakfast to get to school on time and/or have irregular lunch or dinner times (Kim, Lee 1993). Sometimes large amounts are eaten at one time because breakfast or lunch is skipped. Because there is little evaluation of the food intake of adolescents using dietary guidelines, it is questionable whether the nutrient requirements of Korean

adolescents are met. The students may have various types of diet-related problems such as malnutrition, obesity, stomach upset, and constipation (Mo 1990). From an early age diet-related problems are exacerbated by pressures due to the burden of school work. In addition they may be attending cram courses to prepare for entrance examinations because of the limited number of openings at the best colleges/universities. Thus, they do not have enough time to spend on other personal needs such as diet, exercise, and sleep.

Adolescence is a period of important transition from childhood to adulthood with a broad spectrum of biological changes, alterations in body composition, and sexual maturation. During this period, therefore, youth need adequate intakes of energy and other nutrients to achieve optimal growth and health. The adolescent years are a formative period when either health-promoting or health-damaging behaviors are developed. The food habits acquired in this period may have a great impact on their future health. Therefore, it is important for adolescents to practice food behaviors that meet their nutrient needs and to adopt dietary behaviors that will delay the onset of chronic disease in later

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life (Terry 1993). Three research studies of American adolescents suggested a need to use adolescence as a teachable time for nutrition because of adolescents' interest in their bodies (Pearce 1985 ; Pearce et al. 1987 ; Searles et al. 1986). Parents, schools, and the government need to help these young individuals make successful and healthy transitions to adulthood by pro-moting healthy food behaviors.

Several studies were located relative to obesity and its related factors, eating behaviors, food preferences, food intake, the relationship between food intake and demographic factors, and nutritional status of Korean secondary school students living in urban or rural areas (Cho et al. 1994 ; Kim, Kim 1989 ; Kim, Lee 1993 ; Kim et al. 1988 ; Ko et al. 1991 ; Lee, Lee 1986 ; Lee et al. 1994 ; Moon et al. 1989). However, comprehensive studies were not found about food intake of Korean adolescents relative to the Korean Food Tower (KFT), a dietary guideline for Koreans with respect to the five food groups including grain products, vegetables and fruits, meat, milk, and fats and sweets. The KFT has been developed by the Korean Nutrition Society (KNS) to illustrate the recommended dietary guideline for the five food groups (The Korean Nutrition Society 1995). The major purpose of this study was to examine the food intake of 285 Korean female students attending a secondary school in Seoul, based on the five basic food groups of the KFT. This study will provide baseline data to develop future nutrition education programs and to improve the home economics curriculum for secondary school students in Korea.

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## Methods

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### 1. Preliminary Study

#### 1) Preliminary checklist

A preliminary study was conducted to obtain construct and content-related evidence of validity for the instrument. A preliminary checklist to be used eventually in designing a food frequency was developed by categorizing foods consumed in Korea into 10 food groups. The 10 food groups were created by combining the detailed 18 food groups documented in the Korean Food Composition Table (The Korean Nutrition Society 1995). Food items were combined in some instances and different food preparation methods were not considered in order to collapse from the 18 Korean food groups to 10 for this research. Most of the food items

were composed of a single food, but some were composed of mixed foods, for example, pizza and sandwiches. There were 351 food items in the 10 groups : (a) Grains, grain products, and potatoes, 74 ; (b) Sweets, 14 ; (c) Beans, bean products, nuts, and seeds, 26 ; (d) Vegetables, 56 ; (e) Fruits, 37 ; (f) Meat, eggs, and sea foods, 97 ; (g) Milk and dairy products, 9 ; (h) Fats and oils, 16 ; (i) Beverages, 6 ; and (j) Miscellaneous, 16. For response to the food frequency checklist there were 9 points on the scale : Never or less than once per month, 1 time per month, 2 to 3 times per month, 1 time per week, 2 times per week, 3 to 4 times per week, 5 to 6 times per week, 1 time per day, and 2 times per day or more. There were three possible responses for the amount consumed each time : small, medium, or large serving. A medium-sized serving provides the reference and is equal to one Korean standard serving size. A small-sized serving is half or less than half of the reference, and a large-sized serving is one and a half or more of the reference. Prior to preliminary testing the English draft of the preliminary checklist was translated into the Korean language. This study was approved by a human subjects review committee.

#### 2) Preliminary testing

Students from one secondary girls' school in Seoul, Korea, were selected by convenience sampling. The preliminary test sample (N = 145) was composed of 42 female students from the third year of the middle school, 47 from the first year of the high school, and 56 from the second year of the high school. The Korean version of the preliminary test instrument was administered to them during their home economics classes. The 351 food items were coded according to the nine points of the food frequency and three categories for serving size. The mean for each food item was obtained by using descriptive statistics in the SPSS sub-programs for Windows, version 8.0.

### 2. Instrument Development

#### 1) Food frequency

The 10 food groups in the preliminary study were reorganized into 5 food groups based on the KFT (The Korean Nutrition Society 1995) : Grain products ; Vegetables and fruits ; Meat, eggs, fish, shellfish, beans, and nuts ; Milk and milk products ; and Fats and sweets. Potatoes were classified into the vegetables and fruits group. Using frequencies,

a total of 74 food items were selected as representative food items for the food frequency questionnaire : Grain products, 15 ; Vegetables and fruits, 31 ; Meat, eggs, fish, shellfish, beans, and nuts, 16 ; Milk and milk products, 4 ; and Fats and sweets, 8. Some of the food items were denoted by a single food name (for example, rice, barley, beef, and strawberries) and some of them by a name inclusive of all the foods having similar nutritional characteristics (for example : green leafy vegetables ; pizza and spaghetti ; chicken and turkey ; tuna, hair tail, yellow croaker, and Alaska pollack ; and mayonnaise and salad dressing). A criterion of selection was whether the food item was consumed more than 2 to 3 times per month, on an average. However, organ meats in the meat group as a rich source of iron was an exception to this criterion in consideration of the low iron consumption among adolescents (Lee et al. 1994). Food preparation methods such as boiled, fried, or grilled were not considered. A nine-point scale for frequency of consumption, as on the preliminary checklist, was used. There were three categories for serving size, as on the preliminary checklist : small, medium, and large with the same interpretations. Examples of medium-sized servings, as documented in the literature, were given on the food frequency questionnaire as markers for some of the foods. Grams were used as the standard unit of measure.

### 2) Demographic information

Ten items were used to obtain demographic information about the respondents : age, father's education level, mother's education level, mother's employment situation, parents' income level, number of family members living together, health status, dental condition, body weight, and height.

### 3) Pilot testing

The instrument was reviewed by four expert judges : one from Food Science and Human Nutrition ; two from Family and Consumer Sciences Education and Studies ; and one from Hotel, Restaurant, and Institution Management. Their comments about the instrument were incorporated into the final revision of the instrument. The final version of the food frequency included 76 food items. A pilot test was conducted with 20 Korean secondary school students to check the adequacy and reliability of the instrument, data collection techniques, data processing procedures, and data analysis methods. All of the pilot test participants fulfilled the necessary sample selection criteria : 14 to 18-year-old secondary

school students and Korean. The Korean version of the instrument was administered to them and the collected data were analyzed by using SPSS sub-programs for Windows, version 8.0.

## 3. Testing

### 1) Data collection

Female students from the third year of middle school, and from the first year and the second year of high school in a girls' school in Seoul, Korea, were selected by convenience sampling. The Korean version of the instrument was administered to them during their home economics classes.

### 2) Data analysis

The 76 food items were coded according to the nine points for food frequency and three categories for serving size. Descriptive statistics were obtained using a SPSS sub-program in order to describe the participants' food intake and demographic information. General Linear Model (GLM) statistics were obtained using a SPSS sub-program to examine the effects of demographic characteristics on food intake.

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## Results

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### 1. Description of Participants

The sample of 285 adolescent girls (between 14 and 17) consisted of 81 middle school (third year), 96 high school (first year), and 108 high school (second year). The distribution of parents' education indicated that fathers had, on the average, more education than the mothers. About 52% of the participants' fathers had a bachelor's (B.S.) degree or higher, whereas only 30% of the mothers had a B.S. degree or higher (Table 1). Approximately half (48%) of the mothers had a job outside the home. Approximately 51% of the participants' families had an income over 2,100,000 won per month, and 17% were below 1,400,000 won. The vast majority (81%) of the participants had four or five family members (including the participant). The majority of the students thought their health condition was average (52%) or better than average (44%). Their reported dental status, however, revealed a different trend ; i.e., 26% of the respondents considered themselves in poor dental condition and 26% good or excellent condition. There were no differences in body weight, height, and Body Mass Index (BMI) among the four age groups at a significance level of  $p < .05$  (Table 2).

**Table 1** General characteristics of the participants (N = 285)

	Age (years)	Number of respondents	Percent of respondents
Ages	14	21	7.4
	15	77	27.0
	16	93	32.6
	17	92	32.3
	No response	2	0.7
	Education level	Father N(%)	Mother N(%)
Education level of parents	Elementary school	3( 1.1)	4( 1.4)
	Middle school	10( 3.5)	22( 7.7)
	High school	100(35.1)	150(52.6)
	College graduate	19( 6.7)	19( 6.7)
	Bachelor's degree	113(39.6)	79(27.7)
	Master's degree	30(10.5)	5( 1.8)
	Ph.D. degree	4( 1.4)	0( 0.0)
No response	6( 2.1)	6( 2.1)	
	Employment	Number of respondents	Percent of respondents
Mother's employment situation	Yes	136	48.0
	No	149	52.0
	Income per month (10000 won)	Number of respondents	Percent of respondents
Parents' monthly income	< 70	5	1.8
	70 – < 140	44	15.4
	140 – < 210	79	27.7
	210 – < 280	51	17.9
	280 – < 350	52	18.2
	≥ 350	42	14.7
No response	12	4.2	
	Size	Number of respondents	Percent of respondents
Family size including the respondents	2 – 3	28	9.8
	4 – 5	232	81.4
	6 – 7	21	7.4
	≥ 8	2	0.7
	No response	2	0.7
	Status	Health N(%)	Dental N(%)
Health and dental status	Poor	11( 3.9)	74(26.0)
	Average	147(51.6)	134(47.0)
	Good	96(33.7)	61(21.4)
	Excellent	28( 9.8)	13( 4.6)
	No response	3( 1.1)	3( 1.1)

## 2. Description of Food Frequency

Three tables are used for each food group to explain the results : (a) summarization of all the data collected from the respondents, which displays the distribution of serving frequency and serving size for the items in each food group ; (b) description of the mean values for serving frequency, serving size, and standardized serving frequency ; and (c) estimation of the distribution of the daily total standardized serving frequency. In an attempt to visualize the result, a

thick vertical line is drawn in each row where the cumulative percentage of the food item crosses 50% (median), and the cell with the highest frequency (mode) of each row is shaded with its numbers italicized and in a bold font in Table 3, 6, 9, 14, 17, and 20. It is important to understand that the rows, i.e., the food items, with both the 50% median line and the shaded mode cell located near the right edge are, in general, consumed more frequently and chosen by more respondents. The individual standardized serving frequency of a food item

**Table 2.** Mean body weight, height, and BMI by age (N = 278)

Age (years)	Number of respondents	Weight (kg)	Height (cm)	BMI (kg/m <sup>2</sup> )
14	20	50.9(1.5) <sup>a</sup>	159.8(1.1)	20.0(0.5)
15	75	52.7(0.8)	161.7(0.5)	20.1(0.3)
16	93	53.6(0.8)	161.6(0.5)	20.5(0.3)
17	90	53.2(0.7)	162.1(0.6)	20.2(0.2)

a : Numbers in ( ) are standard error of mean

**Table 3.** Distribution of serving frequency and serving size in percentage of grain products

Grain products	Serving frequency									Serving size		
	Never or less than once per month	1 time per month	2-3 times per month	1 time per week	2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day or more	Small	Medium	Large
Rice	0.0 <sup>a</sup> (0.0) <sup>b</sup>	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.4 (0.4)	0.4 (0.8)	0.4 (1.2)	4.9 (6.1)	94.0 (100.0)	8.4	73.0	18.6
Biscuits, crackers, cookies	3.2 (3.2)	1.4 (4.6)	3.5 (8.1)	11.2 (19.3)	16.1 (35.4)	21.4 (56.8)	18.9 (75.7)	18.9 (94.6)	5.3 (100.0)	19.7	46.2	34.1
Ra Myon	4.9 (4.9)	1.4 (6.3)	9.5 (15.8)	21.1 (36.9)	28.1 (65.0)	23.2 (88.2)	7.7 (95.9)	4.2 (100.0)	0.0 (100.0)	9.1	74.5	16.4
Barley	28.8 (28.8)	6.3 (35.1)	9.8 (44.9)	6.3 (51.2)	5.6 (56.8)	7.7 (64.5)	5.6 (70.1)	6.7 (76.8)	23.2 (100.0)	88.1	11.2	0.7
Ddokbokgi, ddokguk	4.2 (4.2)	6.7 (10.9)	20.4 (31.3)	20.0 (51.3)	20.7 (72.0)	18.2 (90.2)	7.7 (97.9)	1.8 (99.7)	0.4 (100.0)	10.8	58.1	31.2
Dock marked bread, cake, cream-jam bread, doughnuts	9.1 (9.1)	8.1 (17.2)	17.2 (34.4)	23.5 (57.9)	16.1 (74.0)	17.2 (91.2)	4.9 (96.1)	3.5 (99.6)	0.4 (100.0)	21.5	60.2	18.3
Loaf bread (toast, sandwich, etc.)	8.4 (8.4)	6.3 (14.7)	21.4 (36.1)	22.5 (58.6)	15.1 (73.7)	12.6 (86.3)	4.2 (90.5)	8.4 (98.9)	1.1 (100.0)	23.3	55.9	20.8
Hamburger bun or hot dog bun	15.4 (15.4)	12.3 (27.7)	26.7 (54.4)	22.5 (76.9)	11.9 (88.8)	7.4 (96.2)	2.8 (99.0)	1.1 (100.0)	0.0 (100.0)	22.7	61.2	16.1
Noodle (cholmyun, chajangmyun, chambong, udong, kalguksu, etc.)	11.6 (11.6)	13.7 (25.3)	35.1 (60.4)	23.2 (83.6)	10.5 (94.1)	4.2 (98.3)	1.4 (99.7)	0.4 (100.0)	0.0 (100.0)	11.2	69.7	19.1
Starch vermicelli (japchae, sundae filling, etc.)	22.1 (22.1)	18.2 (40.3)	32.6 (72.9)	14.0 (86.9)	6.0 (92.9)	5.3 (98.2)	1.1 (99.3)	0.4 (99.7)	0.4 (100.0)	32.7	51.3	16.0
Other rice products : shiruduck, injulmi, songpyon, yacksik, popped rice	23.5 (23.5)	22.1 (45.6)	29.5 (75.1)	12.3 (87.4)	4.9 (92.3)	4.2 (96.5)	2.1 (98.6)	1.4 (100.0)	0.0 (100.0)	37.9	44.1	18.0
Pizza, spaghetti	23.5 (23.5)	24.6 (48.1)	36.8 (84.9)	7.4 (92.3)	5.3 (97.6)	0.7 (98.3)	1.8 (100.0)	0.0 (100.0)	0.0 (100.0)	9.2	57.2	33.6
Glutinous rice	38.6 (38.6)	12.3 (50.9)	17.2 (68.1)	6.3 (74.4)	6.3 (80.7)	4.9 (85.6)	0.7 (86.3)	3.5 (89.8)	10.2 (100.0)	71.8	25.5	2.7
Cereals	44.6 (44.6)	8.1 (52.7)	17.9 (70.6)	7.7 (78.3)	5.6 (83.9)	7.4 (91.3)	3.2 (94.5)	4.6 (99.1)	1.1 (100.0)	34.7	46.3	18.9
Other grains : job's tears, oatmeal, millet, sorghum	53.7 (53.7)	6.3 (60.0)	10.9 (70.9)	7.0 (77.9)	2.8 (80.7)	3.5 (84.2)	1.4 (85.6)	4.2 (89.8)	10.2 (100.0)	92.8	6.8	0.4

a : Percentage of respondents, b : Cumulative percentage

is calculated by multiplying the two weighting factors, i.e., serving frequency and serving size. This is done individually for all the respondents before the mean values are placed, and thereby, the mean standardized serving frequency may be at variance with the value resulting from the direct multiplication of the mean serving frequency per day and the mean serving size, as observed in tables showing mean values. The total standardized serving frequency of an individual for a specific food group then is obtained by adding the

respondent's standardized serving frequency values of all the items in the group. It must be noted that the total standardized serving frequency per day is based on a medium-sized serving. With the aid of these tables, the results are presented starting from the group located at the bottom of the Korean Food Tower (i.e., grain products) followed in sequence by vegetables and fruits, meat, milk, and fats and sweets.

### 1) Grain products

Most of the respondents (94%) ate rice twice or more

**Table 4.** Means for daily serving frequency, serving size, and standardized serving frequency of grain products

Food items	Serving frequency <sup>a</sup>	Serving size <sup>b</sup>	Standardized serving frequency <sup>c</sup>
Rice	1.94(0.02) <sup>d</sup>	1.05(0.02)	2.00(0.03)
Barley	0.65(0.05)	0.56(0.01)	0.36(0.03)
Biscuits, crackers, cookies	0.62(0.03)	1.07(0.02)	0.71(0.04)
Ra Myon	0.34(0.01)	1.04(0.02)	0.36(0.02)
Glutinous rice	0.31(0.04)	0.65(0.02)	0.19(0.02)
Loaf bread (toast, sandwich, etc.)	0.30(0.02)	0.99(0.02)	0.29(0.02)
Other grains : job's tears, oatmeal, millet, sorghum	0.30(0.04)	0.54(0.01)	0.16(0.02)
Ddokbokgi, ddokguk	0.28(0.02)	1.10(0.02)	0.32(0.02)
Dock marked bread, cake, cream-jam bread, doughnuts	0.26(0.02)	0.98(0.02)	0.26(0.02)
Cereals	0.17(0.02)	0.92(0.02)	0.19(0.02)
Hamburger bun or hot dog bun	0.16(0.01)	0.97(0.02)	0.16(0.01)
Noodle (cholmyun, chajangmyun, chambbong, udong, kalguksoo, etc.)	0.13(0.01)	1.04(0.02)	0.14(0.01)
Starch vermicelli (japchae, sundae filling, etc.)	0.12(0.01)	0.92(0.02)	0.12(0.01)
Other rice products : shiruduck, injulmi, songpyon, yacksik, popped rice	0.12(0.01)	0.90(0.02)	0.11(0.01)
Pizza, spaghetti	0.08(0.01)	1.12(0.02)	0.10(0.01)

a : Total sample number for serving frequency is 285, b : Total sample number for serving size varies from 251 to 285 due to missing values, c : Total sample number for standardized serving frequency varies from 281 to 285 due to missing values, d : Numbers in ( ) are standard error of mean.

every day, and most of them (73%) ate a medium-sized serving with mean serving frequency/day = 1.94, mean serving size = 1.05 (Table 3, 4). “Barley” and “Biscuits, crackers, cookies” together with “Rice” were the only other items with a mean serving frequency of more than four times a week. A slight majority (51%) ate “Barley” once a week or less, including a significant portion (28.8%) who ate it never or less than once a month. However, “Barley” had a high mean serving frequency because a substantial number (23.2%) ate it twice per day or more. “Biscuits, crackers, cookies” were chosen by the majority (65%) at least 3 to 4 times a week and the mean frequency was 4.34 times a week. The remaining food items in the “grain products” group were consumed less frequently. “Ra Myon”, “Glutinous rice”, “Loaf bread (toast, sandwich, etc.)”, “Other grains : job's tears, oatmeal, millet, sorghum”, “Ddokbokgi, ddokguk” and “Dock marked bread, cake, cream-jam bread, doughnuts” were consumed about twice a week. “Cereals”, “Hamburger bun or hot dog bun”, “Noodle (cholmyun, chajangmyun, chambbong, udong, kalguksoo, etc.)”, “Starch vermicelli (japchae, sundae filling, etc.)” and “Other rice products : shiruduck, injulmi, songpyon, yacksik, popped rice” were consumed approximately once a week. “Pizza, spaghetti” was eaten on the average only 2.4 times a month. Among the less frequently consumed items, two, “Glutinous rice” and “Other grains : job's tears,

**Table 5.** Distribution of the total standardized serving frequency of intake for grain products (mean = 5.5 times/day, s.d. = ± 2.5, N = 269)

Total standardized serving frequency/day	Percentage
< 3.5	16.0
3.5 – 5.9	52.0
6.0 – 10.9	30.1
> 11	1.9

oatmeal, millet, sorghum” need further comment. High proportions (10.2%, for each) of the respondents who ate them twice per day or more caused the mean frequency for each item to be a little over twice a week even though the majority ate them never or at the most once a month (Table 3).

Most items in the grain products group were consumed mainly in a medium size serving. Exceptions included “Barley”, “Glutinous rice” and “Other grains : job's tears, oatmeal, millet, sorghum” which were, on an average, consumed in small amounts. This may be understood by the fact that these items are cooked in most Korean families in small amounts as an addition to rice.

Table 5 summarizes the distribution of the total standardized serving frequency of the grain products' intake in four intervals. According to the Korean Food Tower three and one-half servings a day is recommended as a serving frequency of the grain products for the Korean female adolescents.

**Table 6.** Distribution of serving frequency and serving size in percentage for unseasonal vegetables and fruits

Vegetables & fruits	Serving frequency									Serving size		
	Never or less than once per month	1 time per month	2-3 times per month	1 time per week	2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day or more	Small	Medium	Large
Cabbage kimchi	5.3 <sup>a</sup> ( 5.3) <sup>b</sup>	0.7 ( 6.0)	0.7 ( 6.7)	1.4 ( 8.1)	1.1 ( 9.2)	4.6 (13.8)	8.4 (22.2)	20.7 (42.9)	57.2 (100.0)	32.0	51.4	16.5
Radish	3.5 ( 3.5)	2.1 ( 5.6)	2.8 ( 8.4)	3.9 (12.3)	7.0 (19.3)	9.8 (29.1)	13.3 (42.4)	28.1 (70.5)	29.5 (100.0)	39.9	49.5	10.7
Green onion, leek, garlic, onion	11.6 (11.6)	4.9 (16.5)	3.5 (20.0)	4.6 (24.6)	4.6 (29.2)	14.7 (43.9)	11.9 (55.8)	21.4 (77.2)	22.8 (100.0)	71.6	25.0	3.4
Vegetables in mixed foods (soup, stew, frying rice, japchae, bibimbab, etc.)	1.4 ( 1.4)	2.5 ( 3.9)	8.8 (12.7)	10.5 (23.2)	13.3 (36.5)	16.8 (53.3)	13.0 (66.3)	18.2 (84.5)	15.4 (100.0)	7.8	62.4	29.8
Laver	1.4 ( 1.4)	2.5 ( 3.9)	5.6 ( 9.5)	10.5 (20.0)	17.5 (37.5)	23.9 (61.4)	12.6 (74.0)	17.2 (91.2)	8.8 (100.0)	25.2	50.4	24.5
Banana	8.8 ( 8.8)	10.2 (19.0)	17.9 (36.9)	12.6 (49.5)	16.5 (66.0)	16.1 (82.1)	6.0 (88.1)	7.7 (95.8)	4.2 (100.0)	25.6	43.4	31.0
Green leafy vegetables (spinach, lettuce, radish leaves, perilla leaf, etc.)	7.4 ( 7.4)	6.7 (14.1)	17.9 (32.0)	19.3 (51.3)	15.1 (66.4)	14.4 (80.8)	10.5 (91.3)	5.6 (96.9)	3.2 (100.0)	48.0	43.7	8.2
100% fruit or vegetable juices	10.5 (10.5)	7.7 (18.2)	18.9 (37.1)	14.7 (51.8)	13.7 (65.5)	12.6 (78.1)	5.6 (83.7)	11.9 (95.6)	4.2 (100.0)	18.6	45.7	35.7
Potatoes	6.0 ( 6.0)	10.5 (16.5)	22.1 (38.6)	16.1 (54.7)	20.4 (75.1)	14.4 (89.5)	8.4 (97.9)	1.8 (99.7)	0.4 (100.0)	19.4	54.1	26.5
Sweet potatoes	12.3 (12.3)	14.7 (27.0)	20.0 (47.0)	18.2 (65.2)	13.7 (78.9)	9.8 (88.7)	7.4 (96.1)	3.2 (99.3)	0.7 (100.0)	21.1	51.9	27.0
Bean sprouts	6.0 ( 6.0)	9.5 (15.5)	33.3 (48.8)	20.4 (69.2)	14.4 (83.6)	12.6 (96.2)	1.8 (98.0)	1.4 (99.4)	0.7 (100.0)	54.6	39.6	5.7
Peppers-green, red	22.5 (22.5)	11.2 (33.7)	14.0 (47.7)	16.8 (64.5)	11.9 (76.4)	14.4 (90.8)	4.2 (95.0)	2.1 (97.1)	2.8 (100.0)	80.1	18.0	1.8
Sea-mustard, tangle	15.1 (15.1)	13.3 (28.4)	26.0 (54.4)	15.4 (69.8)	13.0 (82.8)	10.2 (93.0)	3.9 (96.9)	2.5 (99.4)	0.7 (100.0)	50.5	39.3	10.2
Mushrooms	22.8 (22.8)	12.3 (35.1)	17.9 (53.0)	13.7 (66.7)	13.7 (80.4)	10.9 (91.3)	4.6 (95.9)	2.1 (98.0)	2.1 (100.0)	56.7	34.1	9.3
Squash, zucchini	27.0 (27.0)	8.4 (35.4)	18.6 (54.0)	17.2 (71.2)	14.0 (85.2)	9.8 (95.0)	2.5 (97.5)	1.4 (98.9)	1.1 (100.0)	72.2	25.3	2.6
Carrot	30.5 (30.5)	7.4 (37.9)	17.9 (55.8)	13.7 (69.5)	11.2 (80.7)	10.5 (91.2)	5.3 (96.5)	2.5 (99.0)	1.1 (100.0)	82.8	14.9	2.3
Lotus root, braken, burdock, bellflower root	27.7 (27.7)	13.0 (40.7)	24.6 (65.3)	13.7 (79.0)	10.2 (89.2)	6.3 (95.5)	2.8 (98.3)	1.4 (99.7)	0.4 (100.0)	71.2	25.5	3.3
Canned fruits (peach, pineapple, citrus fruits, etc.)	43.2 (43.2)	17.9 (61.1)	16.1 (77.2)	4.6 (81.8)	5.6 (87.4)	4.9 (92.3)	1.4 (93.7)	3.5 (97.2)	2.8 (100.0)	36.2	42.3	21.5

a : Percentage of respondents, b : Cumulative percentage

It is shown in Table 5 that the majority (84%) of the respondents meet the recommended serving frequency for the grain products, and the mean, which is estimated to be 5.5 is above the recommendation.

## 2) Vegetables and fruits

Approximately 57% of the respondents ate "Cabbage kimchi" twice a day or more, usually in a medium-sized serving (Table 6). It was consumed most frequently with a mean serving frequency of 1.45 times/day (Table 7). The items chosen by the majority with a relatively high serving frequency included "Radish" (at least once a day by 58%

with the mean = 1.05 times/day), "Green onion, leek, garlic, onion" (5 to 6 times per week or more by 56% with the mean = 0.86 time/day), "Vegetables in mixed foods (soup, stew, fried rice, japchae, bibimbab, etc.)" (3 to 4 times per week or more by 64% with the mean = 0.74 time/day) and "Laver" (at least 3 to 4 times by 63% with the mean = 0.64 time/day). "100% fruit or vegetable juices", "Banana" and "Green leafy vegetables (spinach, lettuce, radish leaves, perilla leaf, etc.)" were consumed by the majority (63% to 68%) at least once a week, with the mean approximately 2.5 times/week (= 0.36 time/day). "Potatoes", "Peppers-green, red", "Sweet potatoes", "Mushrooms", "Bean sprouts", "Sea-mu-

**Table 7.** Means for daily serving frequency, serving size, and standardized serving frequency of vegetables and fruits

Food items	Serving frequency <sup>a</sup>	Serving size <sup>b</sup>	Standardized serving frequency <sup>c</sup>
Cabbage kimchi	1.45(0.04) <sup>d</sup>	0.92(0.02)	1.41(0.05)
Radish	1.05(0.04)	0.85(0.02)	0.97(0.05)
Green onion, leek, garlic, onion	0.86(0.04)	0.66(0.02)	0.58(0.03)
Vegetables in mixed foods (soup, stew, fried rice, japchae, bibimbab, etc.)	0.74(0.04)	1.11(0.02)	0.83(0.04)
Laver	0.64(0.03)	1.00(0.02)	0.67(0.04)
100% fruit or vegetable juices	0.39(0.03)	1.09(0.02)	0.46(0.04)
Banana	0.37(0.03)	1.03(0.02)	0.43(0.04)
Green leafy vegetables (spinach, lettuce, radish leaves, perilla leaf, etc.)	0.36(0.02)	0.80(0.02)	0.31(0.02)
Potatoes	0.27(0.02)	1.04(0.02)	0.29(0.02)
Peppers-green, red	0.26(0.02)	0.61(0.01)	0.17(0.02)
Sweet potatoes	0.24(0.02)	1.03(0.02)	0.27(0.02)
Mushrooms	0.23(0.02)	0.76(0.02)	0.21(0.02)
Bean sprouts	0.21(0.01)	0.76(0.02)	0.16(0.01)
Sea-mustard, tangle	0.21(0.02)	0.80(0.02)	0.17(0.01)
Carrot	0.21(0.02)	0.60(0.01)	0.15(0.02)
Squash, zucchini	0.19(0.02)	0.65(0.02)	0.13(0.01)
Canned fruits (peach, pineapple, citrus fruits, etc.)	0.17(0.02)	0.93(0.02)	0.21(0.03)
Lotus root, braken, burdock, bellflower root	0.15(0.01)	0.66(0.02)	0.10(0.01)

a : Total sample number for serving frequency is 285, b : Total sample number for serving size varies from 262 to 282 due to missing values, c : Total sample number for standardized serving frequency varies from 282 to 285 due to missing values, d : Numbers in ( ) are standard error of mean

**Table 8.** Distribution of the total standardized serving frequency of intake for vegetables and fruits (mean = 7.1 times/day, s.d. = 4.1, N = 272)

Total standardized serving frequency/day	Percentage
<3	12.5
3 – 5.9	32.0
6 – 9.9	37.1
≥ 10	18.4

stard, tangle”, “Carrot”, “Squash, zucchini”, “Canned fruits (peach, pineapple, citrus fruits, etc.)” and “Lotus root, braken, burdock, bellflower root” were chosen on the average 1 to 2 times a week. Forty-three percent of the respondents indicated they never ate canned fruits or ate them less than once a month.

The items with higher frequencies were, in general, consumed in a medium size serving while those with smaller frequencies in a small size serving. The exception to this was “Green onion, leek, garlic, onion” which indicated “small” as the major serving size. This may be explained by the fact that these items are used mainly as seasonings and added in small amounts.

Table 8 summarizes the distribution of the total standardized serving frequency of vegetables and fruits in four

intervals. The Korean Nutrition Society suggests 6.0 servings/day as a recommended serving frequency of the total vegetables and fruits’ group intake for the Korean female adolescents. Slightly more than one-half of the respondents meet the recommended serving frequency even without including the seasonal group.

The results of the sample distribution for the food items in the seasonal vegetables and fruits group, with respect to the serving frequency and serving size, are summarized in Table 9. Table 10 presents the mean values for the serving frequency, serving size, and standardized serving frequency on a daily basis. Because of a restriction in availability throughout the year, Table 10 has an additional column for the standardized serving frequency through the year which takes into account the year-equivalent factors based on the number of months seasonal items are available, which is given in Table 11.

Seasonal vegetables and fruits were consumed with significantly higher frequencies in season compared to other vegetables and fruits. “Citrus fruit”, “Apple”, “Watermelon” and “Grapes” were most favored among the young female respondents, with approximately 64% eating “Citrus fruit” 1 time per day or more, and approximately half of them eating



**Table 9.** Distribution for serving frequency and serving size in percentage of seasonal vegetables and fruits

Seasonal vegetables & fruits	Serving frequency									Serving Size		
	Never or less than once per month	1 time per month	2-3 times per month	1 time per week	2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day or more	Small	Medium	Large
Citrus fruit	0.4 <sup>a</sup> ( 0.4) <sup>b</sup>	0.4 ( 0.8)	1.1 ( 1.9)	2.1 ( 4.0)	2.1 ( 6.1)	15.8 (21.9)	14.4 (36.3)	24.2 (60.5)	39.6 (100.0)	3.5	21.5	75.0
Watermelon	6.7 ( 6.7)	2.1 ( 8.8)	2.8 (11.6)	4.9 (16.5)	10.9 (27.4)	17.9 (45.3)	20.0 (65.3)	18.9 (84.2)	15.8 (100.0)	9.4	29.3	61.2
Apple	3.5 ( 3.5)	0.7 ( 4.2)	3.2 ( 7.4)	6.7 (14.1)	11.6 (25.7)	23.2 (48.9)	16.8 (65.7)	18.6 (84.3)	15.8 (100.0)	14.2	34.5	51.2
Grapes	5.3 ( 5.3)	2.1 ( 7.4)	3.9 (11.3)	6.3 (17.6)	9.8 (27.4)	23.9 (51.3)	17.5 (68.8)	15.1 (83.9)	16.1 (100.0)	13.2	30.4	56.4
Persimmon	5.3 ( 5.3)	2.8 ( 8.1)	7.7 (15.8)	9.8 (25.6)	15.4 (41.0)	22.1 (63.1)	17.2 (80.3)	10.2 (90.5)	9.5 (100.0)	23.1	43.3	33.6
Melones	7.0 ( 7.0)	2.8 ( 9.8)	7.4 (17.2)	11.2 (28.4)	13.3 (41.7)	22.8 (64.5)	13.3 (77.8)	14.7 (92.5)	7.4 (100.0)	19.0	38.0	43.0
Strawberry	9.5 ( 9.5)	2.8 (12.3)	7.0 (19.3)	10.9 (30.2)	20.7 (50.9)	21.8 (72.7)	9.8 (82.5)	10.5 (93.0)	7.0 (100.0)	17.9	38.6	43.6
Peach	11.2 (11.2)	4.2 (15.4)	11.2 (26.6)	11.6 (38.2)	17.5 (55.7)	18.6 (74.3)	7.7 (82.0)	9.5 (91.5)	8.4 (100.0)	21.4	41.3	37.3
Pear	4.2 ( 4.2)	8.8 (13.0)	12.3 (25.3)	14.0 (39.3)	18.6 (57.9)	15.8 (73.7)	9.1 (82.8)	11.2 (94.0)	6.0 (100.0)	20.2	45.1	34.7
Tomatoes	10.2 (10.2)	4.9 (15.1)	11.2 (26.3)	11.2 (37.5)	21.1 (58.6)	17.2 (75.8)	9.8 (85.6)	9.8 (95.4)	4.6 (100.0)	25.5	42.4	32.0
Plum	10.2 (10.2)	5.6 (15.8)	11.2 (27.0)	14.0 (41.0)	18.9 (59.9)	13.7 (73.6)	9.1 (82.7)	10.5 (93.2)	6.7 (100.0)	30.1	41.2	28.7
Cucumber	6.0 ( 6.0)	7.0 (13.0)	16.8 (29.8)	18.6 (48.4)	16.1 (64.5)	20.7 (85.2)	7.7 (92.9)	4.9 (97.8)	2.1 (100.0)	35.7	45.1	19.1
Corn	13.0 (13.0)	10.9 (23.9)	21.8 (45.7)	16.1 (61.8)	16.8 (78.6)	11.6 (90.2)	4.9 (95.1)	4.2 (99.3)	0.7 (100.0)	21.9	52.5	25.5

a : Percentage of respondents, b : Cumulative percentage

**Table 10.** Means for daily serving frequency, serving size, and standardized serving frequency of seasonal vegetables and fruits

Food items	Serving frequency <sup>a</sup>	Serving size <sup>b</sup>	Standardized serving frequency	
			in season through the year <sup>c</sup>	
Citrus fruit	1.24(0.04) <sup>d</sup>	1.36(0.02)	1.72(0.06)	0.57(0.02)
Apple	0.80(0.04)	1.19(0.02)	1.02(0.05)	0.50(0.03)
Watermelon	0.79(0.04)	1.26(0.02)	1.08(0.05)	0.36(0.02)
Grapes	0.77(0.04)	1.22(0.02)	1.01(0.05)	0.25(0.01)
Persimmon	0.60(0.03)	1.01(0.02)	0.71(0.04)	0.18(0.01)
Melons	0.57(0.03)	1.12(0.02)	0.70(0.04)	0.23(0.01)
Strawberry	0.51(0.03)	1.13(0.02)	0.65(0.04)	0.16(0.01)
Peach	0.49(0.03)	1.08(0.02)	0.59(0.04)	0.15(0.01)
Pear	0.47(0.03)	1.08(0.02)	0.54(0.04)	0.22(0.02)
Plum	0.46(0.03)	0.99(0.02)	0.52(0.04)	0.09(0.01)
Tomatoes	0.44(0.03)	1.03(0.02)	0.51(0.04)	0.17(0.01)
Cucumber	0.34(0.02)	0.92(0.02)	0.35(0.03)	0.15(0.01)
Corn	0.25(0.02)	1.01(0.02)	0.27(0.02)	0.09(0.01)

a : Total sample number for serving frequency is 285, b : Total sample number for serving size varies from 276 to 284 due to missing values, c : Total sample number for standardized serving frequency varies from 282 to 285 due to missing values, d : Numbers in ( ) are standard error of mean

“Apple”, “Watermelon” and “Grapes” at least 5 to 6 times a week mostly in a large-sized serving (51% to 75%), with mean frequencies of 1.24, 0.80, 0.79, and 0.77 time/day in season, respectively (Table 9, 10). The items “Persimmon” and “Melons” also were included in the high serving frequency items which the majority (60%) ate at least 3 to 4

**Table 11.** Months of the year seasonal vegetables and fruits are available and the year equivalent for the available period<sup>a</sup>

Seasonal vegetables & fruits	Month												Year Equivalent	
	1	2	3	4	5	6	7	8	9	10	11	12		
Citrus fruit														0.33
Apple														0.50
Watermelon														0.33
Grapes														0.25
Persimmon														0.25
Melones														0.33
Strawberry														0.25
Peach														0.25
Pear														0.42
Plum														0.17
Tomatoes														0.33
Cucumber														0.42
Corn														0.33

a : The information in this table is available in the web site at (<http://www.garak.co.kr>). Garak is the name of the wholesale market located in Seoul where the respondents of this study are living. Garak is the biggest distribution center for fruits and vegetables which most local retailers are mainly using. Retrieved on January 3, 1998

**Table 12.** Distribution of the total standardized serving frequency of intake for seasonal vegetables and fruits through the year (mean = 3.5 times/day, s.d. = ± 2.4, N = 272)

Total standardized serving frequency/day	Percentage
< 1	6.7
1 – 2.9	48.6
3 – 5.9	29.9
≥ 6	14.8

**Table 13.** Distribution of the total standardized serving frequency for intake of vegetables and fruits with the seasonal ones (mean = 10.6 times/day, s.d. = ± 5.5, N = 271)

Total standardized serving frequency/day	Percentage
< 3	2.6
3 – 5.9	15.5
6 – 9.9	34.3
> 10	47.6

times a week, with means of 0.60 and 0.57 time/day in season, respectively. “Strawberry”, “Peach”, “Pear”, “Plum” and “Tomatoes” were chosen by 60 to 70% of the students twice a week or more, with means ranging from 0.44 to 0.51 time/day (3 to 4 times/week). “Cucumber” and “corn” had means of 0.34 and 0.25 time/day (1.8 to 2.4 times/week), and the majority (54% to 70%) of respondents ate them at least once a week.

Seasonal items with higher frequencies, in general, are consumed in large-sized servings while the less frequent ones generally are consumed in medium-sized servings. No

items in this seasonal vegetable and fruit group in the main had a small serving size.

Table 12 summarizes the distribution of the total standardized serving frequency of the seasonal vegetables and fruits throughout the year, by intervals of five. The values in Table 12 are added to the values in Table 8 to estimate the total intake frequency for vegetables and fruits (Table 13). Table 13 indicates that the 81.9% of the respondents meet the recommended serving frequency, and the mean, which is estimated at 10.6, is above the recommendation of 6.0.

### 3) Meat, eggs, fish, shellfish, beans, and nuts

Although 61% of the respondents ate “Beans, nuts” once per week or less, approximately 28% ate them 3 to 4 times per week or more, which resulted in the high mean serving frequency (Table 14). No item in this group had a high frequency such as rice and cabbage kimchi which were consumed twice or more every day by the majority. “Soybean paste, red pepper paste”, “Egg, quail’s egg”, “Beef, pork, chicken in mixed foods (stew, fried rice, etc.)” and “Seeds-perilla, sesame” were consumed by 45 to 65% of the participants at least 3 times a week, with means of 0.63, 0.55, 0.52, and 0.46 time/day, respectively (Table 14, 15). “Anchovies, icefishes”, “Beans, nuts”, “Ham”, “Tofu”, “Tuna, hair tail, yellow croaker, Alaska pollack”, “Pork”, “Beef”, “Sausage, bacon”, “Mackerel, Pacific saury”, “Fish paste, fish sausage”, “Squid, shrimp, clam, solen” and “Chicken, turkey” were con-

**Table 14.** Distribution of serving frequency and serving size in percentage for the meat group

Meat, eggs, fish, shellfish, beans, & nuts	Serving frequency										Serving size		
	Never or less than once per month	1 time per month	2-3 times per month	1 time per week	2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day	or more			
	Small	Medium	Large										
Soybean paste, red pepper paste	4.2 <sup>a</sup> ( 4.2) <sup>b</sup>	2.1 ( 6.3)	6.0 (12.3)	11.2 (23.5)	11.2 (34.7)	24.2 (58.9)	18.2 (77.1)	14.0 ( 91.1)	8.8 (100.0)		39.3	44.0	16.7
Egg, quail's egg	2.8 ( 2.8)	2.1 ( 4.9)	5.6 (10.5)	11.9 (22.4)	18.2 (40.6)	23.9 (64.5)	17.2 (81.7)	14.0 ( 95.7)	4.2 (100.0)		19.0	58.4	22.6
Beef, pork, chicken in mixed foods(stew, fry rice, etc.)	4.6 ( 4.6)	2.1 ( 6.7)	11.6 (18.3)	11.6 (29.9)	12.6 (42.5)	27.4 (69.9)	12.6 (82.5)	13.0 ( 95.5)	4.6 (100.0)		13.7	56.8	29.5
Seeds-perilla, sesame	13.3 (13.3)	6.3 (19.6)	13.7 (33.3)	10.2 (43.5)	11.6 (55.1)	13.3 (68.4)	13.7 (82.1)	4.6 ( 95.4)	4.6 (100.0)		72.5	22.8	4.7
Ham	10.9 (10.9)	5.6 (16.5)	14.0 (30.5)	15.1 (45.6)	15.8 (61.4)	23.9 (85.3)	10.9 (96.2)	2.5 ( 98.7)	1.4 (100.0)		35.3	45.5	19.3
Anchovies, icefishes	7.0 ( 7.0)	7.7 (14.7)	17.5 (32.2)	16.1 (48.3)	16.5 (64.8)	15.8 (80.6)	7.4 (88.0)	7.4 ( 95.4)	4.6 (100.0)		48.2	39.6	12.1
Tofu	4.6 ( 4.6)	4.9 ( 9.5)	15.8 (25.3)	19.3 (44.6)	21.8 (66.4)	16.8 (83.2)	10.9 (94.1)	5.6 ( 99.7)	0.4 (100.0)		26.6	53.6	19.8
Tuna, hair tail, yellow croaker, alaska pollack	5.6 ( 5.6)	6.7 (12.3)	18.2 (30.5)	21.8 (52.3)	17.5 (69.8)	17.5 (87.3)	4.9 (92.2)	7.4 ( 99.6)	0.4 (100.0)		26.4	53.6	20.0
Pork	4.2 ( 4.2)	4.6 ( 8.8)	19.3 (28.1)	24.6 (52.7)	19.6 (72.3)	16.8 (89.1)	8.1 (97.2)	2.5 ( 99.7)	0.4 (100.0)		20.1	49.5	30.4
Beef	5.6 ( 5.6)	10.5 (16.1)	20.7 (36.8)	17.2 (54.0)	18.6 (72.6)	15.1 (87.7)	8.4 (96.1)	3.5 ( 99.6)	0.4 (100.0)		22.1	53.6	24.3
Sausage, bacon	19.6 (19.6)	9.8 (29.4)	14.0 (43.4)	15.1 (58.5)	16.1 (74.6)	15.8 (90.4)	6.7 (97.1)	1.4 ( 98.5)	1.4 (100.0)		40.4	43.7	15.9
Fish paste, fish sausage	8.4 ( 8.4)	10.5 (18.9)	20.7 (39.6)	19.6 (59.2)	23.2 (82.4)	9.5 (91.9)	6.0 (97.9)	2.1 (100.0)	0.0 (100.0)		41.8	43.6	14.6
Mackerel, Pacific saury	10.9 (10.9)	9.8 (20.7)	23.9 (44.6)	18.2 (62.8)	12.3 (75.1)	16.8 (91.9)	6.0 (97.9)	2.1 (100.0)	0.0 (100.0)		37.0	43.8	19.2
Squid, shrimp, clam, solen	8.1 ( 8.1)	10.5 (18.6)	28.8 (47.4)	19.6 (67.0)	17.5 (84.5)	9.5 (94.0)	3.5 (97.5)	2.1 ( 99.6)	0.4 (100.0)		30.6	50.0	19.4
Beans, nuts	16.8 (16.8)	13.3 (30.1)	21.1 (51.2)	10.2 (61.4)	10.9 (72.3)	7.0 (79.3)	6.0 (85.3)	6.3 ( 91.6)	8.4 (100.0)		60.1	31.5	8.3
Chicken, turkey	9.5 ( 9.5)	13.7 (23.2)	35.8 (59.0)	21.1 (80.1)	10.5 (90.6)	6.0 (96.6)	2.5 (99.1)	0.7 ( 99.8)	0.4 (100.0)		18.6	37.1	44.3
Organ meats(liver, kidney, etc.)	60.4 (60.4)	10.2 (70.6)	14.7 (85.3)	8.8 (94.1)	3.5 (97.6)	1.4 (99.0)	0.4 (99.4)	0.4 ( 99.8)	0.4 (100.0)		80.1	17.5	2.4

a : Percentage of respondents, b : Cumulative percentage

**Table 15.** Means for daily serving frequency, serving size, and standardized serving frequency of the meat group

Food items	Serving frequency <sup>a</sup>	Serving size <sup>b</sup>	Standardized serving frequency <sup>c</sup>
Soybean paste, red pepper paste	0.63(0.03) <sup>d</sup>	0.88(0.02)	0.60(0.03)
Egg, quail's egg	0.55(0.03)	1.02(0.02)	0.59(0.03)
Beef, pork, chicken in mixed foods(stew, fried rice, etc.)	0.52(0.03)	1.08(0.02)	0.57(0.03)
Seeds-perilla, sesame	0.46(0.03)	0.66(0.02)	0.32(0.03)
Anchovies, icefishes	0.39(0.03)	0.82(0.02)	0.36(0.03)
Beans, nuts	0.38(0.03)	0.74(0.02)	0.32(0.03)
Ham	0.34(0.02)	0.92(0.02)	0.34(0.02)
Tofu	0.34(0.02)	0.97(0.02)	0.35(0.02)
Tuna, hair tail, yellow croaker, Alaska pollack	0.31(0.02)	0.97(0.02)	0.33(0.02)
Pork	0.29(0.02)	1.05(0.02)	0.32(0.02)
Beef	0.28(0.02)	1.01(0.02)	0.30(0.02)
Sausage, bacon	0.26(0.02)	0.88(0.02)	0.26(0.03)
Mackerel, Pacific saury	0.24(0.01)	0.91(0.02)	0.24(0.02)
Fish paste, fish sausage	0.23(0.01)	0.86(0.02)	0.22(0.02)
Squid, shrimp, clam, solen	0.21(0.01)	0.94(0.02)	0.21(0.02)
Chicken, turkey	0.16(0.01)	1.13(0.02)	0.19(0.02)
Organ meats(liver, kidney, etc.)	0.06(0.01)	0.61(0.01)	0.04(0.01)

a : Total sample number for serving frequency is 285, b : Total sample number for serving size varies from 251 to 280 due to missing values, c : Total sample number for standardized serving frequency varies from 281 to 285 due to missing values, d : Numbers in ( ) are standard error of mean

sumed 0.16 to 0.39 time/day (1 to 3 times/week), on average. Nearly 60% of the respondents consumed “Organ meats (liver, kidney, etc.)” never or less than once a month, with a mean consumption frequency of 0.06 time/day (less than twice/month). Taking into consideration the low iron intake among Korean female adolescents, more frequent consumption of red meat such as beef, organ meat and pork is recommended (Lee et al. 1994). The items in the meat group were generally consumed in a medium-sized serving except “Seedsperilla, sesame”, “Anchovies, icefish”, “Beans, nuts” and “organ meats” which tended to be consumed in small-sized servings.

Table 16 summarizes the distribution of the total standardized serving frequency of the meat group. The Korean Nutrition Society (KNS) suggests 5.0 servings/day as a recommended serving frequency for the total intake of the meat group for Korean female adolescents. As shown in Table 16,

**Table 16.** Distribution of the total standardized serving frequency of intake for the meat group (mean = 5.5, s.d. = ± 3.7 times/day, N = 271)

Total standardized serving frequency/day	Percentage
<2	24.3
2 – 4.9	31.4
5 – 7.9	22.2
≥ 8	22.1

approximately 44% of the respondents meet the recommended serving frequency, and the mean, which is estimated at 5.5 is above the recommendation.

**4) Milk and milk products**

Milk was consumed by slightly more than one-half of the respondents at least 5 to 6 times a week in a medium-sized serving, with mean serving frequency of 0.76 time/day (Table 17, 18). Ice cream and yogurt also had a significant serving frequency, nearly 50% eating ice cream at least 3 to 4 times a week and yogurt twice a week or more, with means of 0.47 and 0.45 time/day. Cheese was the least frequently consumed item in this group; about 60% of the respondents eating cheese less than once a week and largely in a small-sized serving, with mean frequency of 0.21 time/day. All milk products except cheese generally were consumed in a medium-sized serving.

Table 19 summarizes the distribution of the total standardized serving frequency of intake from the milk group.

**Table 19.** Distribution of the total standardized serving frequency for the intake of the milk group (mean = 2.1 times/day, s.d. = ± 1.4, N = 284)

Total standardized serving frequency/day	Percentage
<1.5	38.7
1.5 – 2.9	39.5
> 3	21.8

**Table 17.** Distribution for serving frequency and serving size in percentage of the milk products

Milk & milk products	Serving frequency										Serving size		
	Never or less than once per month	1 time per month	2 – 3 times per month	1 time per week	2 times per week	3 – 4 times per week	5 – 6 times per week	1 time per day	2 times per day or more	Small	Medium	Large	
	( 4.6) <sup>a</sup> ( 4.6) <sup>b</sup>	( 2.1) ( 6.7)	( 6.3) (13.0)	( 8.4) (21.4)	( 8.4) (29.8)	(17.5) (47.3)	(11.9) (59.2)	(27.7) (86.9)	(13.0) (100.0)				
Milk	4.6 <sup>a</sup> ( 4.6) <sup>b</sup>	2.1 ( 6.7)	6.3 (13.0)	8.4 (21.4)	8.4 (29.8)	17.5 (47.3)	11.9 (59.2)	27.7 (86.9)	13.0 (100.0)	14.8	58.3	26.9	
Ice cream	2.5 ( 2.5)	1.4 ( 3.9)	10.5 (14.4)	15.1 (29.5)	20.4 (49.9)	22.8 (72.7)	15.4 (88.1)	9.1 (97.2)	2.8 (100.0)	9.9	51.4	38.7	
Yogurt	7.4 ( 7.4)	6.0 (13.4)	16.1 (29.5)	15.1 (44.6)	15.1 (59.7)	12.3 (72.0)	10.2 (82.2)	12.6 (94.8)	5.3 (100.0)	27.9	53.2	18.9	
Cheese	27.0 (27.0)	13.3 (40.3)	21.4 (61.7)	11.6 (73.3)	8.8 (82.1)	7.7 (89.8)	4.2 (94.0)	4.6 (98.6)	1.4 (100.0)	59.1	31.4	9.5	

a : Percentage of respondents, b : Cumulative percentage

**Table 18.** Means for daily serving frequency, serving size, and standardized serving frequency of the milk group

Food items	Serving frequency <sup>a</sup>	Serving size <sup>b</sup>	Standardized serving frequency <sup>c</sup>
Milk	0.76(0.03) <sup>d</sup>	1.06(0.02)	0.87(0.05)
Ice cream	0.47(0.02)	1.14(0.02)	0.57(0.03)
Yogurt	0.45(0.03)	0.96(0.02)	0.47(0.04)
Cheese	0.21(0.02)	0.75(0.02)	0.18(0.02)

a : Total sample number for serving frequency is 285, b : Total sample number for serving size varies from 274 to 283 due to missing values, c : Total sample number for standardized serving frequency varies from 284 to 285 due to missing values, d : Numbers in ( ) are standard error of mean

**Table 20.** Distribution for serving frequency and serving size in percentage of the fats and sweets

Fats & sweets	Serving frequency									Serving size		
	Never or less than once per month	1 time per month	2-3 times per month	1 time per week	2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 times per day or more	Small	Medium	Large
Perilla oil, sesame oil	4.2 <sup>a</sup> ( 4.2) <sup>b</sup>	2.1 ( 6.3)	9.1 (15.4)	9.1 (24.5)	13.0 (37.5)	19.3 (56.8)	20.0 (76.8)	16.1 (92.9)	7.0 (100.0)	57.3	39.5	3.2
Corn oil, soybean oil	6.7 ( 6.7)	2.8 ( 9.5)	6.7 (16.2)	10.2 (26.4)	13.7 (40.1)	17.5 (57.6)	15.4 (73.0)	17.9 (90.9)	9.1 (100.0)	56.5	37.7	5.8
Tea	10.2 (10.2)	4.2 (14.4)	12.3 (26.7)	9.5 (36.2)	10.5 (46.7)	16.8 (63.5)	9.1 (72.6)	17.2 (89.8)	10.2 (100.0)	21.8	62.9	15.4
Candies, chocolate	3.2 ( 3.2)	2.1 ( 5.3)	9.5 (14.8)	16.5 (31.3)	15.8 (47.1)	22.8 (69.9)	16.5 (86.4)	10.2 (96.6)	3.5 (100.0)	23.9	48.9	27.1
Carbonated beverages	6.7 ( 6.7)	1.8 ( 8.5)	13.0 (21.5)	17.9 (39.4)	15.8 (55.2)	19.6 (74.8)	12.3 (87.1)	8.8 (95.9)	4.2 (100.0)	15.5	57.0	27.4
Mayonnaise, salad dressing	17.2 (17.2)	9.1 (26.3)	14.0 (40.3)	20.0 (60.3)	16.1 (76.4)	13.3 (89.7)	6.7 (96.4)	3.2 (99.6)	0.4 (100.0)	47.4	37.2	15.4
Jam	20.7 (20.7)	11.2 (31.9)	20.7 (52.6)	13.7 (66.3)	12.6 (78.9)	11.2 (90.1)	3.9 (94.0)	5.3 (99.3)	0.7 (100.0)	48.3	40.8	10.9
Margarine, butter	20.7 (20.7)	11.9 (32.6)	20.4 (53.0)	10.2 (63.2)	15.1 (78.3)	10.9 (89.2)	4.9 (94.1)	5.3 (99.4)	0.7 (100.0)	63.2	32.9	4.0
Cocoa	33.7 (33.7)	11.9 (45.6)	15.8 (61.4)	10.2 (71.6)	8.4 (80.0)	9.1 (89.1)	4.2 (93.3)	5.6 (98.9)	1.1 (100.0)	34.8	58.1	7.0

a : Percentage of respondents, b : Cumulative percentage

**Table 21.** Means for daily serving frequency, serving size, and standardized serving frequency of fats and sweets

Food items	Serving frequency <sup>a</sup>	Serving size <sup>b</sup>	Standardized serving frequency <sup>c</sup>
Corn oil, soybean oil	0.63(0.03) <sup>d</sup>	0.75(0.02)	0.50(0.03)
Perilla oil, sesame oil	0.61(0.03)	0.73(0.02)	0.45(0.03)
Tea	0.59(0.03)	0.97(0.02)	0.64(0.04)
Candies, chocolate	0.49(0.02)	1.02(0.02)	0.54(0.03)
Carbonated beverages	0.45(0.03)	1.06(0.02)	0.53(0.04)
Mayonnaise, salad dressing	0.25(0.02)	0.84(0.02)	0.23(0.02)
Margarine, butter	0.24(0.02)	0.70(0.02)	0.18(0.01)
Jam	0.23(0.02)	0.81(0.02)	0.21(0.02)
Cocoa	0.21(0.02)	0.86(0.02)	0.21(0.02)

a : Total sample number for serving frequency is 285, b : Total sample number for serving size varies from 265 to 281 due to missing values, c : Total sample number for standardized serving frequency varies from 283 to 285 due to missing values, d : Numbers in ( ) are standard error of mean

The Korean Nutrition Society suggests 1.5 servings per day as the recommended serving frequency from the milk group for Korean female adolescents. Table 19 reveals that 61.3% of the samples meet the recommended serving frequency, and the mean, which is estimated at 2.1, is above the recommendation.

**5) Fats and sweets**

“Corn oil, soybean oil”, “Perilla oil, sesame oil”, “Tea”, “Candies, chocolate” and “Carbonated beverages” were chosen by 45 to 63% of the respondents at least 3 to 4 times a week, with a major serving size “small” for the first two items and “medium” for the last three items, with mean ser-

**Table 22.** Distribution of the total standardized serving frequency of the intake for fats and sweets (mean = 3.5 times/day, s.d. = ± 2.5, N = 282)

Total standardized serving frequency/day	Percentage
< 2	28.4
2 - 3.9	37.6
≥ 4	34.0

ving frequencies ranging from 0.45 to 0.63 time/day (Table 20, 21). “Mayonnaise, salad dressing”, “Margarine, butter”, “Jam” and “Cocoa” which were eaten by a significant proportion (17% to 34%) of the respondents never or less than once a month, were consumed by 30 to 40% at least twice a week, with the mean ranging from 0.21 to 0.25 time/day, and

**Table 23.** Parameter estimates of the food intake for the five food groups

Food group ⇒ Parameter ↓	Grain products			Vegetables & fruits			Meat		
	t	Sig.	Power	t	Sig.	Power	t	Sig.	Power
Intercept	0.123	.902	.052	0.148	.883	.052	0.103	.918	.051
9 <sup>th</sup> grade	0.961	.338	.160	1.432	.154	.297	2.040	.042	.529
10 <sup>th</sup> grade	2.342	.020	.645	1.541	.125	.335	1.302	.194	.254
11 <sup>th</sup> grade <sup>a</sup>									
Mother's job (no)	0.208	.835	.055	1.241	.216	.235	-0.356	.722	.064
Mother's job (yes) <sup>a</sup>									
Age	1.437	.152	.299	1.523	.129	.329	1.665	.097	.382
Father's educ.	2.081	.039	.545	0.184	.854	.054	-0.151	.880	.053
Mother's educ.	-0.946	.345	.156	0.072	.943	.051	0.813	.417	.128
Income	1.043	.298	.180	1.606	.110	.359	3.415	.001**	.925
Family size	0.865	.388	.138	-1.262	.208	.242	-0.308	.758	.061
Health status	1.826	.069	.444	-1.403	.162	.287	0.964	.336	.160
Dental status	-0.421	.674	.070	1.470	.143	.310	0.386	.700	.067
Weight	0.012	.990	.050	0.101	.920	.051	0.058	.954	.050
Height	-0.082	.935	.051	-0.120	.904	.052	-0.252	.801	.057
BMI	-0.139	.890	.052	-0.092	.927	.051	-0.063	.950	.050
Corrected model F (Sig.)	2.170 (.011)			0.999 (.453)			2.140 (.013)		
Grade F (Sig.)	3.533 (.031)			1.272 (.282)			2.139 (.120)		
R <sup>2</sup>	0.106			0.052			0.106		
Sample size	252			253			249		

\*\* : Significance level at p < .01

a : The rows, "11<sup>th</sup> grade" and "Mother's job (yes)", are empty because they were used as references for comparison

**Table 23.** (Continued)

Food group ⇒ Parameter ↓	Milk			Fats & sweets		
	t	Sig.	Power	t	Sig.	Power
Intercept	-0.952	.342	.158	1.339	.163	.286
9 <sup>th</sup> grade	1.665	.097	.382	0.405	.686	.069
10 <sup>th</sup> grade	0.561	.575	.086	0.777	.438	.121
11 <sup>th</sup> grade <sup>a</sup>						
Mother's job (no)	0.238	.812	.056	-0.507	.613	.080
Mother's job (yes) <sup>a</sup>						
Age	1.795	.074	.432	1.084	.279	.191
Father's educ.	-0.432	.666	.072	0.019	.985	.050
Mother's educ.	0.630	.529	.096	0.251	.802	.057
Income	2.686	.008**	.763	2.879	.004**	.818
Family size	-0.381	.703	.067	-0.339	.690	.068
Health status	0.176	.860	.054	-0.158	.875	.053
Dental status	0.433	.665	.072	-0.282	.778	.059
Weight	-0.955	.340	.158	1.349	.179	.269
Height	0.753	.452	.116	-1.458	.146	.306
BMI	0.917	.360	.150	-1.412	.159	.290
Corrected model F (Sig.)	1.499 (0.118)			1.447 (0.139)		
Grade F (Sig.)	1.904 (0.161)			0.336 (0.715)		
R <sup>2</sup>	0.073			0.071		
Sample size	263			261		

**Table 24.** Estimated mean total standardized serving frequency, the serving frequency recommended by The Korean Nutrition Society, and the percentage of the respondents consuming less than the recommendation (N = 247)

Food group ⇒	Grain products	Vegetables & fruits	Meat	Milk	Fats & sweets
Mean total standardized serving frequency (times/day) (percentage of KNS)	5.5 (157.1%)	10.6 (176.7%)	5.5 (110.0%)	2.1 (140.0%)	3.5 (87.5%)
Recommended serving frequency (times/day)	3.5	6	5	1.5	4
Percentage of respondents below the recommendation	16.6	17.4	54.7	39.7	65.7

**Table 25.** Percentage of the respondents who met the recommended serving frequency in the number of food groups (N = 247)

Number of food groups ⇒	0	1	2	3	4	5
Percentage	4.1	11.7	17.8	27.1	19.4	19.9
Cumulative percentage	4.1	15.8	33.6	60.7	80.1	100.0

generally in a small- or medium-sized serving.

The distribution of the total standardized serving frequency of the fats and sweets are summarized in Table 22. The Korean Nutrition Society suggests four servings per day as the recommended serving frequency of the fats and sweets for Korean female adolescents. It is indicated in Table 22 that only 34% of the respondents meet the recommended serving frequency, and the mean, which is estimated at 3.5, is below the recommendation.

### 3. Effects of Demographic Factors on Food Intake

Only one variable, income, was found to be a predictor for food intake. Income positively affected the consumption of food items in the meat, milk, and fats and sweets groups ( $p < .01$ ) (Table 23). Participants who lived in families with higher incomes tended to eat more foods in these food groups. This is expected because the price for the items in these three food groups is, in general, higher than that of the other groups.

## Discussion

The major objective of this study was to examine the food intake of Korean female adolescents relative to the KFT. The recommended serving frequency for a specific food group was estimated by considering the proportion of both the nutrients and the amount of energy that is supplied from that food group. The KNS especially emphasizes eating sufficient protein-containing foods, drinking milk every day, and consuming an adequate amount of fat-containing foods to supply approximately 20% of the total daily energy need. The

emphasis on fat-containing foods arose from the fact that the fat consumption percentage was reported to be 9% of the total daily energy intake in rural areas and 15% in urban areas, significantly lower than the recommendation (The Korean Nutrition Society 1995).

In Table 24 the mean total standardized serving frequency from this study was compared with the serving frequencies recommended by KNS for Korean female adolescents (The Korean Nutrition Society 1995). The total standardized serving frequency per day was calculated based on a medium-sized serving. The mean values were above the recommendations by 10 to 77% except for fats and sweets, which was 12.5% below. The average values for the participants, however, do not provide sufficient information regarding the dietary behavior of each individual to judge whether an individual has an adequate diet or whether there are specific problem areas that need to be addressed. The last row of Table 24 indicated the percentage of respondents who did not meet the recommended serving frequency in a specific food group. Even in the groups "grain products" and "vegetables and fruits" where the mean total standardized serving frequency was 57% and 77% above the recommendation, respectively, 16.6% and 17.4% of the respondents ate them less than the recommendation. The situation deteriorates further in the other food groups. The percentage of the respondents who needed to consume more of "meat" was 54.7%, "milk" 39.7%, and "fats and sweets" 65.7%. This result is supportive of the KNS dietary guideline which recommends sufficient consumption of these three food groups (The Korean Nutrition Society 1995).

The percentage of the respondents who met the recommended serving frequency by food group numbers is presented in Table 25. The dietary intake of only 19.9% satisfied the recommendation for all five food groups and 4.1% fell short for all five food groups. The data indicated conclusively that one of the most serious problems may be related to an imbalance in food consumption. The first statement included

in the Korean dietary guideline by KNS puts an emphasis on a balanced diet from the five food groups (The Korean Nutrition Society 1995).

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### Implications for Research and Practice

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This research is limited with respect to the subjects used to gather data. Only one female school was used to gather data. This may restrict the generalizability of the results for the entire Korean adolescent group. Additional examination is needed to explore the subjects living in other areas. Also, additional examination of male as well as female secondary school students is needed. The findings from this study suggest that one of the most serious dietary problems may be related to an apparent imbalance in food consumption. The imbalance in the dietary behavior may be an indication of the need for future nutrition education programs for the students as well as for their parents. Therefore, the study will provide baseline data to develop future nutrition education programs, to design nutrition education materials, and to improve the home economics curriculum for secondary school students in Korea.

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