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Variety of Food Choices is Associated with the Nutritional Quality of Diets of College Students in Korea

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Abstract

This study was performed to evaluate effects of dietary variety scores (DVS) and dietary diversity scores (DDS) on the nutritional quality of the diets of Korean college students, and to examine the association between food group intake patterns and nutritional adequacy. This study examined the relationship of dietary diversity scores (DDS), dietary variety scores (DVS), and food group intake patterns with nutrient intakes using 24-hour recall data (n=358). The DDS was calculated from the sum of each of the five food groups consumed as a score of "1". DVS was determined by counting the number of food items consumed daily. Food group intake patterns were expressed with the presence or omission of five major food groups-dairy, meat, grain, fruit, and vegetable. The four most prevalent food group patterns and the proportion of the population reporting them were as follows; no dairy and fruit, 23%; no dairy, 20%; no dairy, meat, and fruit, 15%; all food groups, 14%. Even though the DDS or DVS was higher, the majority of this study population failed to meet the Korean RDA for calcium in both genders and iron in women. Higher DVS scores (≥31), within all DDS groups, were associated with the largest proportion of individuals consuming more than 75% of the Korean RDA for selected nutrients. The consistency of these results indicates that screening diets to evaluate the overall dietary variety and variety among the major food groups including food group intake patterns provide meaningful information about their quality.

Key words: Korean college students, dietary variety score (DVS), dietary diversity score (DDS), food group intake patterns, 24-hour recall

INTRODUCTION

The Korean National Health Promotion Act of 1995 was implemented to address the changing health needs of the Korean people. It was enacted to encourage and support health education, health practice, and improvements in nutritional status (1). The act emphasized on nutrition because of associations linking diet with chronic diseases such as non-insulin-dependent diabetes, hypertension, coronary artery disease, and cancer (2). There is some evidence that young adults in Korea may be at high risk for nutritional problems. According to the 2001 National Health and Nutrition Survey for Koreans (3), the average intakes of calcium, iron, vitamin A, and riboflavin were lower than the Recommended Dietary Allowances for Koreans (4).

Recently, there has been an increased interest in monitoring the intake of foods to evaluate whether the population is conforming to current food-based dietary guidelines. Consumption of diverse foods is the most important means of assuring adequate intakes of essential nutrients for optimal health and preventing chronic diseases. The recommendation of increasing the variety of foods in the daily diet has been included in the dietary guidelines of several countries. Many researchers have attempted to study relationships between diet quality and the variety of foods and food groups (5-10). In addition, with the recognition that dietary factors affect the risk of chronic disease, several studies have examined the relationship of diet quality with mortality, vascular disease, hypertension, and cancer (7,11-16). It is also worthwhile to develop devices based on foods and food groups relating to diet quality in order for consumers to improve their dietary plan. Few researchers have investigated relationships between overall diet variety, food group intake patterns, and nutrient intakes among the Korean young adult population. Despite the dietary guideline for Koreans to eat a variety of foods, there is relatively little known about how food variety affects the dietary quality of Korean young adults (10,17). This study was per-

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formed to evaluate effects of the DVS and DDS on dietary quality of Korean college students and to examine the association between food group intake patterns and nutrition adequacy.

MATERIALS AND METHODS

Subjects and data collection

Subjects were 144 male and 214 female college students aged 19 years or older who were enrolled in introductory nutrition courses at two universities located in Seoul and Ansung cities, Korea from March 1 to June 30, 2003. Subject characteristics, age, height, weight, and dietary intake data were obtained by a personal interview. BMI (kg/m^2) was calculated from self-reported height and weight. Interviews were conducted by graduate students majoring in food and nutrition, all of whom were trained by researchers from the Korea Health Industry Development Institute. Dietary intake data were derived from a single 24-hour recall. Interviewers used actual size 2-dimensional models of traditional bowls, shapes of foods, and rulers to help the subjects report the volume and dimensions of food items consumed. To obtain specific recipes and final volume of foods prepared, interviewers visited the subject's homes and interviewed the person who was responsible for meal preparation in each household.

Dietary diversity score (DDS), dietary variety score (DVS), and patterns of food group intake

The dietary diversity score (DDS) was assessed based on the method developed by Kant et al. (7,13). First, all foods (2,337 items) were grouped into 18 food groups based on the Korean Food Composition Tables (18). Then foods were further grouped into these five groups - dairy, meat, grain, fruit, and vegetable. DDS was based on counting the number of food groups consumed daily. Therefore, one point was counted for each food group consumed, so the maximum score was five. The grain group included all grain products plus pulses, nuts and seeds. Cookies, candies, or cakes were not included in the grain group. All milk products were assigned to the dairy group. The vegetable group included all raw and cooked vegetables, mushrooms, and seaweeds. The fruit group included all fresh and dried fruits and fruit juices. Oil and fats, soft drink beverages, alcoholic beverage, sugars and sweeteners were excluded from the dietary diversity score calculation. The minimum food weight criteria for including foods in the diversity scores were 30 g for meat, fruit, and vegetable groups (for all solids), 60 g for all beverages and mixed dishes, 15 g for dairy and grain groups (for all solids), and 30 g for dairy and grain groups (for all liquids) and mixed dishes.

Food group intakes were referred to as DMGFV (dairy, meat, grain, fruit, and vegetable), with number 1 indicating presence and 0 indicating absence of the food groups based on the method used by Kant et al. (19). Thus, DMGFV=10111 indicates a pattern in which all groups except meat were consumed on the survey day.

The dietary variety score (DVS) counted the number of different foods consumed daily among all food groups. It did not include seasonings such as salt, vinegar, pepper, red pepper powder, and soybean paste. Oil and fats, soft drink beverages, alcoholic beverages, sugar and sweeteners were also excluded from the dietary variety score calculation.

Nutritional data

Nutrient intake data were analyzed for total energy, carbohydrate, protein, fat, calcium, iron, vitamin A, thiamin, riboflavin, niacin, and vitamin C using Korean Food Composition Tables (18) and calculated as a percentage of the Recommended Dietary Allowance for Koreans (4).

Statistical analyses

All analyses were performed with SAS software (version 8.01, 2001, SAS Institute, Inc., Cary, NC). ANOVA and Duncan's multiple range tests were used to check differences of nutrient intake by DDS or DVS. Spearman correlation coefficients were calculated to identify relationships among DVS, DDS, and nutrient intake. Differences between means of DVS by DDS were compared by ANOVA and Duncan's multiple range tests.

RESULTS AND DISCUSSION

Characteristics of the subjects

Subject characteristics are summarized in Table 1. The mean age for male students was 26 years and 25 years for female students, and the mean body mass index (kg/m^2) was 23.3 for the male students and 20.9 for female students.

Dietary intakes

Mean nutrient intakes and % of RDA for Koreans are

Table 1. Anthropometric data of subjects

Variables	Male students (n=144)	Female students (n=214)
Age (y)	26±4[1)]	25±3
Height (cm)	173±5	161±5
Weight (kg)	69.3±9.2	54.1±8.2
Body mass index[2)]	23.3±3.0	20.9±3.2

[1)]Mean±SD.
[2)]Calculated as kg/m^2.

Table 2. Dietary intake data of subjects

Nutrients	Male students (n=144)		Female students (n=214)	
Energy (kcal)	2,297±1,004[1]	(91)[2]	1,850±642	(91)
Carbohydrate (g)	349±145		290±108	
Protein (g)	91±56	(120)	71±49	(117)
Fat (g)	54±39		45±29	
Calcium (mg)	531±324	(75)	471±298	(65)
Iron (mg)	14±7	(116)	11±5	(61)
Vitamin A (R.E.)	786±731	(111)	664±648	(93)
Thiamin (mg)	1.6±1.0	(124)	1.2±0.6	(122)
Riboflavin (mg)	1.3±0.8	(82)	1.1±0.6	(90)
Niacin (mg)	19±13	(114)	14±7	(111)
Vitamin C (mg)	112±75	(204)	120±104	(217)

[1]Mean±SD.
[2]% of Korean RDA, 7th revision, 2000.

presented separately by gender in Table 2. The nutrient intake levels of the female students were generally about 80% of the intake levels among the male students. On the average, male students consumed 2,297 kcal with 63% of the energy derived from carbohydrate, 15% from protein, 20% from fat, and 2% from alcohol. On the average, female students consumed 1,850 kcal with 63% of energy from carbohydrate, 15% from protein, 21% from fat, and 1% from alcohol. For comparison purposes, the energy intakes from the National Nutrition Survey for Koreans were similar: 2,363 kcal/day for males and 1,887kcal/day for females in the 20- to 29-year old age group (3). Calcium was the nutrient of lowest intake adequacy for male students and iron for female students.

Dietary diversity score, dietary variety score, and patterns of food group intake

The distribution of DDS among Korean college students is shown in Table 3. Ninety three % of male students and 82% of female students scored below 5 on DDS; they did not consume foods from all five food groups on the day of the survey. Fifty two % of the males scored 0 to 3 on DDS, compared with 48% of the females.

Table 4 presents patterns of food group intake (ranked in descending order) consumed by the subjects. Four prevalent patterns accounted for 72% of the subjects. The most frequently reported pattern for both gender groups was the consumption of foods from three of the five food groups, omitting the dairy and fruit groups (DMGFV= 01101). This pattern was reported by 30% of males and 19% of females. Omission of the dairy group in diets was reported by 68% of total subjects. Consumption of foods from all five food groups (DMGFV=11111) was reported by only 8% of males and 18% of females.

Table 3. Distribution of dietary diversity scores by gender

DDS[1]	All (n=358)		Male students (n=144)		Female students (n=214)	
	n	%	n	%	n	%
≤2	56	15	24	17	32	15
3	132	37	62	43	70	33
4	121	34	47	33	74	34
5	49	14	11	7	38	18

[1]DDS counts the number of food groups (dairy, meat, grain, fruit, and vegetable) consumed daily.

Table 4. Ranking the patterns of food group intake by gender

Rank	All (n=358)		Male students (n=144)		Female students (n=214)	
	DMGFV[1]	N (%)	DMGFV	N (%)	DMGFV	N (%)
1	01101	23	01101	30	01101	19
2	01111	20	01111	23	01111	18
3	00101	15	00101	16	11111	18
4	11111	14	00111	10	00101	14
5	00111	9	11111	8	10111	9
6	10111	7	11101	7	00111	9
7	11101	7	10111	3	11101	7
8	10101	4	10101	3	10101	5
9	00010	1	00010	0	00010	1
10	10110	0	10110	0	10110	0

[1]DMGFV=dairy, meat, grain, fruit, and vegetable groups; 1=food group(s) present; 0=food group(s) absent. For example, DMGFV=11111 denotes that all food groups (dairy, meat, grain, fruit, and vegetable) were consumed; DMGFV=01101 indicates that three food groups (meat, grain, and vegetable) were consumed and two food groups (dairy and fruit) were not consumed.

The distribution of the DVS is summarized in Table 5. On the average, male and female students consumed 26 to 27 different types of foods. Fifty % of respondents scored 21~30 on DVS (Table 5). Drewnowski et al. (5,20) reported that the mean number of different foods consumed for one day among 837 French adults was 26 for males and 28 for females and 13 for men and 17 for women among 24 American young adults. The French and the Koreans were more likely to consume a diet with more variety than Americans. Some studies (21,22) have found that men consume diets with more variety than women. In contrast, Krondl et al. (23) reported that women had diets with more variety than

Table 5. Distribution of dietary variety scores by gender

DVS[1]	All (n=358)		Male students (n=144)		Female students (n=214)	
	n	%	n	%	n	%
≤20	77	21	31	22	46	22
21~25	93	26	37	26	56	26
26~30	85	24	35	24	50	23
≥31	103	29	41	28	62	29

[1]DVS counts the total number of food items consumed daily.

Table 6. Mean nutrient intake and % of the Korean RDA by dietary diversity score

Nutrient	DDS[1]			
	≤2 (n=56)	3 (n=132)	4 (n=121)	5 (n=49)
Energy (kcal)				
Male	1845[3)b4)] (72)[5)]	2263[ab] (90)	2482[a] (99)	2681[a] (106)
Female	1353[c] (67)	1855[b] (91)	1890[b] (93)	2178[a] (108)
Carbohydrate (g)				
Male	318	346	368	360
Female	226[b]	294[a]	294[a]	325[a]
Protein (g)				
Male	64 (84)	95 (126)	94 (126)	110 (146)
Female	46[c] (76)	69[b] (113)	72[b] (119)	95[a] (157)
Fat (g)				
Male	34[c]	49[bc]	61[b]	87[a]
Female	24[c]	43[b]	47[b]	62[a]
Calcium (mg)				
Male	366[c] (50)	501[bc] (71)	588[b] (84)	817[a] (113)
Female	301[c] (42)	464[b] (64)	483[b] (66)	605[a] (85)
Iron (mg)				
Male	10 (87)	14 (115)	14 (124)	17 (142)
Female	7[b] (40)	11[a] (63)	11[a] (63)	13[a] (73)
Vitamin A (R.E.)				
Male	523 (72)	898 (128)	743 (106)	909 (129)
Female	440[c] (63)	764[ab] (108)	572[bc] (79)	847[a] (121)
Thiamin (mg)				
Male	1.2[c] (90)	1.5[bc] (117)	1.8[b] (138)	2.3[a] (180)
Female	0.8[b] (80)	1.3[a] (127)	1.2[a] (122)	1.5[a] (149)
Riboflavin (mg)				
Male	0.9[b] (58)	1.3[b] (82)	1.3[b] (85)	1.9[a] (123)
Female	0.6[c] (57)	1.0[b] (88)	1.1[b] (90)	1.4[a] (122)
Niacin (mg)				
Male	14 (80)	19 (112)	22 (129)	22 (129)
Female	9[b] (72)	14[a] (108)	16[a] (123)	16[a] (129)
Vitamin C (mg)				
Male	76[b] (135)	98[b] (179)	142[a] (258)	146[a] (266)
Female	58[c] (106)	106[b] (192)	135[ab] (244)	167[a] (305)
DVS[2]	20.9[3)c]	25.6[b]	28.8[a]	29.1[a]

[1]DDS counts the number of food groups (dairy, meat, grain, fruit, and vegetable) consumed daily.
[2]DVS counts the total number of food items consumed daily.
[3]Mean.
[4]Means with the same letter in the same row are not significantly at $p<0.05$ by Duncan's multiple range test.
[5]% of Korean RDA.

men. In this study, more females had higher DVS scores than males (data not shown).

Relationship of nutrient intakes with dietary diversity and variety scores, and food intake patterns

The data in Table 6 shows mean nutrient intake and % of Korean RDA by DDS. Energy and nutrient intake increased with increasing DDS, except for vitamin A, for both genders. Average nutrient intakes for those with scores of 5 on the DDS were above the Korean RDA except for calcium and iron in female students. The mean DVS was higher with increasing DDS but not significantly different between those with DDS scores of 4 and 5.

The mean nutrient intake and % of RDA for Koreans by DVS level are presented in Table 7. All nutrient intakes increased at each DVS level. Average nutrient intakes for those with scores ≥31 of DVS were below the RDA for calcium in male and female students and for iron in females.

Correlation coefficients between dietary variety score and dietary diversity score with nutrient intakes are shown in Table 8. Higher DDS is also associated with higher DVS. The scores of DDS and DVS correlated positively with energy and nutrient intake, but were unrelated with DDS for vitamin A intake.

Table 9 presents the numbers and proportion of the subjects consuming more than 75% of the Korean RDA for selected nutrients among the DDS and DVS levels. A larger proportion of subjects met at least 75% of the Korean RDA for energy, calcium, iron, vitamin A, and

Table 7. Mean nutrient intake and % of the Korean RDA by dietary variety score level

Nutrient	DVS[1]			
	≤20 (n=77)	21~25 (n=93)	26~30 (n=85)	≥31 (n=103)
Energy (kcal)				
Male	1717[2)c3)] (67)[4)]	2169[b] (80)	2276[b] (90)	2869[a] (114)
Female	1539[c] (74)	1713[bc] (85)	1926[ab] (96)	2142[a] (105)
Carbohydrate (g)				
Male	287[b]	338[b]	344[b]	411[a]
Female	248[b]	259[b]	307[a]	334[a]
Protein (g)				
Male	55[c] (71)	76[bc] (102)	97[b] (130)	125[a] (167)
Female	52[b] (84)	63[b] (106)	82[a] (137)	83[a] (136)
Fat (g)				
Male	39[b]	46[b]	57[ab]	69[a]
Female	35[b]	45[ab]	43[ab]	54[a]
Calcium (mg)				
Male	313[c] (42)	511[b] (72)	563[ab] (80)	687[a] (98)
Female	331[c] (44)	456[b] (64)	466[b] (66)	593[a] (82)
Iron (mg)				
Male	10[c] (80)	11[bc] (96)	14[b] (121)	18[a] (156)
Female	8[c] (45)	10[b] (58)	11[ab] (66)	13[a] (72)
Vitamin A (R.E.)				
Male	571[b] (79)	554[b] (79)	846[ab] (120)	1106[a] (158)
Female	396[b] (54)	635[ab] (90)	706[a] (100)	855[a] (119)
Thiamin (mg)				
Male	1.2[b] (96)	1.5[ab] (120)	1.6[ab] (122)	1.9[a] (151)
Female	1.1 (108)	1.1 (118)	1.2 (122)	1.4 (137)
Riboflavin (mg)				
Male	0.9[b] (58)	1.2[ab] (78)	1.3[a] (86)	1.6[a] (101)
Female	0.8[c] (65)	1.0[b] (88)	1.1[ab] (93)	1.3[a] (109)
Niacin (mg)				
Male	13[c] (74)	15[bc] (93)	20[ab] (122)	26[a] (155)
Female	11[b] (86)	13[b] (100)	15[a] (122)	17[a] (132)
Vitamin C (mg)				
Male	91[b] (164)	95[b] (173)	122[ab] (222)	136[a] (247)
Female	85[c] (153)	94[bc] (172)	128[ab] (233)	163[a] (293)

[1)]DVS counts the total number of food items consumed daily.
[2)]Mean.
[3)]Means with the same letter in the same row are not significantly at $p<0.05$ by Duncan's multiple range test.
[4)]% of Korean RDA.

Table 8. Correlation of dietary variety and dietary diversity score with nutrient intake

Nutrients	DVS[1]	DDS[2]
DDS	0.3238***	
Energy	0.3408***	0.2295***
Protein	0.3477***	0.2030***
Fat	0.1956***	0.3093***
Calcium	0.3443***	0.2781***
Iron	0.3930***	0.1993***
Vitamin A	0.2662***	0.0837
Thiamin	0.1592**	0.2215***
Riboflavin	0.2594***	0.2642***
Vitamin C	0.2518***	0.3235***
Niacin	0.3121***	0.1910***

[1]DVS counts the total number of food items consumed daily.
[2]DDS counts the number of food groups (dairy, meat, grain, fruit, and vegetable) consumed daily.
**p<0.01, ***p<0.001.

riboflavin with increasing DDS and DVS levels. For iron and vitamin A intake, there was a little difference between the proportions of subjects consuming more than 75% of Korean RDA with a DVS ≥31 with increasing DDS level. But the proportion in calcium and riboflavin was higher in those who had a DDS of 5 and DVS ≥31 than in those who had a DDS of 4 and DVS ≥31 (89% vs. 50%, 95% vs. 58%, respectively).

Table 10 shows the proportion of subjects consuming more than 75% of the Korean RDA for selected nutrients among DDS 4 and 5 and DVS 26~30 and ≥31 according to food group intake patterns. The pattern (DMGFV= 11111) with the highest DVS level (≥31) was associated with the largest proportion of the subject consuming more than 75% of the RDA for selected nutrients. The

Table 9. Numbers and proportions of subjects consuming more than 75% of the Korean RDA by dietary diversity score and dietary variety score level

DDS[1]	DVS[2]	Nutrient				
		Energy	Calcium	Iron	Vitamin A	Riboflavin
0~3	≤20 (n=57)	20[3] (35)[4]	6 (11)	14 (25)	18 (32)	19 (33)
	21~25 (n=54)	27 (50)	13 (24)	20 (37)	17 (31)	17 (31)
	26~30 (n=43)	32 (74)	11 (26)	21 (49)	23 (53)	17 (40)
	≥31 (n=34)	25 (74)	16 (47)	20 (59)	26 (76)	20 (59)
4	≤20 (n=15)	5 (38)	0 (0)	4 (31)	1 (8)	1 (8)
	21~25 (n=26)	18 (69)	8 (31)	11 (42)	12 (46)	16 (62)
	26~30 (n=30)	22 (73)	16 (53)	17 (57)	15 (50)	20 (67)
	≥31 (n=50)	43 (86)	25 (50)	29 (58)	34 (68)	29 (58)
5	≤20 (n= 5)	4 (80)	2 (40)	3 (60)	2 (40)	4 (80)
	21~25 (n=13)	7 (54)	6 (46)	1 (8)	7 (54)	11 (85)
	26~30 (n=12)	11 (92)	6 (50)	7 (58)	9 (75)	11 (92)
	≥31 (n=19)	19 (100)	17 (89)	19 (63)	15 (79)	18 (95)

[1]DDS counts the number of food groups (dairy, meat, grain, fruit, and vegetable) consumed daily.
[2]DVS counts the total number of food items consumed daily.
[3]Numbers of subjects.
[4]% of subjects.

Table 10. Percent of subjects consuming more than 75% of the Korean RDA by 4 and 5 of dietary diversity score and 26~30 and 31 of dietary variety score level according to food group intake patterns

DDS[1]	DMGFV[2]	DVS[3]	Nutrient				
			Energy	Calcium	Iron	Vitamin A	Riboflavin
4	01111 (n=18)	26~30	72[4]	33	61	44	61
	10111 (n=8)		63	75	38	50	63
	11101 (n=4)		100	100	75	75	100
	01111 (n=26)	31	88	35	65	77	46
	10111 (n=10)		80	60	10	60	70
	11101 (n=14)		86	71	79	57	71
5	11111 (n=12)	26~30	92	50	58	75	92
	11111 (n=19)	31	100	89	63	79	95

[1]DDS counts the number of food groups (dairy, meat, grain, fruit, and vegetable) consumed daily.
[2]DMGFV=dairy, meat, grain, fruit, and vegetable groups; 1=food group(s) present; 0=food group(s) absent.
For example, DMGFV=11111 denotes that all food groups (dairy, meat, grain, fruit, and vegetable) were consumed; DMGFV=01101 indicates that three food groups (meat, grain, and vegetable) were consumed and two food groups (dairy and fruit) were not consumed.
[3]DVS counts the total number of food items consumed daily.
[4]% of subjects.

subjects who met at least 75% of the recommended level of calcium and riboflavin were less likely to omit the dairy group, and those meeting iron recommendations were less likely to omit the meat group.

CONCLUSION

Adequate intake of nutrients is important for maintaining optimal health and preventing chronic diseases. Our findings suggest that overall dietary variety and variety among major food groups are important factors associated with nutrient intake. The diets of Korean college students in this study were proportionately lower in calcium and riboflavin for men and calcium, iron, vitamin A, and riboflavin for women than the Korean RDA. These results confirm previous observations of the 2001 National Nutrition Survey for Koreans (3). Even though variety score was higher, the majority of this study population of both genders failed to meet the Korean RDA for calcium, and women failed to meet the RDA for iron. These findings are consistent with the results of the previous study of Korean young adults (10). Calcium intake has frequently been reported to be less than adequate in the diets of young women (24-27). Although the dietary guidelines ofthe Korean Nutrition Society recommended daily servings of milk and dairy products, 68% of the respondents did not consume the minimum level for the dairy group. These results are more likely associated with lower intake of calcium and riboflavin. The iron intake of young women has also consistently been found to be lower than recommended (25-27). In this study, the mean daily iron intake among the Korean women (11 mg) was the same as the Oklahoma cohort, however lower than the Oregon cohort (14 mg) (28). The iron intake was somewhat greater from legumes, grains and cereals, and vegetables (0.78, 2.19, and 2.64 mg, respectively) than from all meats and egg (2.63 and 0.73 mg, respectively) (data not shown). Kye and Paik (29) found that dietary iron bioavailability in the diets of Korean college women was lower than the reported values in adult women consuming typical western diets but falls within the range estimated for vegetarians. Considering the low bioavailability of iron in the diets of Korean young adult women, more efforts should be made to increase consumption of iron from animal foods and bioavailability of iron in the diet. Lee et al. (10) suggested that a daily intake of 24~32 (or 28) of DVS using a single 24-hour recall from a sample of 287 Koreans (20~49 years) was recommendable for an optimal nutriture of all nutrients, if the variety of food groups and sufficient intakes of vitamin A and calcium were emphasized together. In this study, even though the DVS level was higher (26~30, ≥31), a larger portion of the subject with a DDS 4 or less failed to meet at least 75% of Korean RDA for calcium, iron, vitamin A, and riboflavin.

Information on food group intake patterns and their nutritional consequences among these population groups would be useful as a basis for designing nutrition interventions and nutrition education materials. Not surprisingly, the lower proportion of subjects consuming more than 75% of the RDA for selected nutrient intakes was associated with diets that lack one or more food groups. For example, calcium and riboflavin: dairy group, iron: meat, vitamin A: fruit. In classifying individuals with low intake of selected nutrients, dietary patterns used in this report would be useful. The low calcium, iron, vitamin A, and riboflavin intakes observed in this population warrant increased efforts to ensure adequate selection of foods. Therefore, programs should be planned to improve diets and include nutrition counseling and education at the national level.

Korean dietary guidelines recommend eating a variety of foods. This is sound guidance since dietary variety for the young adults in this study was related to nutrient adequacy. Some caution must be taken in interpreting these findings because the dietary score was assessed from a single 24-hour recall. The method for describing the dietary pattern including DDS has some limitations in the amounts of each food group eaten (above the minimum). Nevertheless, the findings of association between variety and nutrient intakes are consistent with other studies (30). Krebs-Smith et al. (30) suggested two points for dietary guidance; if food choices are varied, one need not eat large quantities of foods. If food intake is limited, choices should be varied. In this study, even though the high dietary scores of DDS 5 and DVS ≥31, some of the proportions failed to meet more than 75% of Korean RDA. From this result, further evaluation of the relationship between diet variety and serving size for nutrient adequacy is warranted.

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