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A Study of the Food and Nutrient Intakes of College Students According to their Frequencies of Eating Out

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This study was carried out to investigate the relationship between the food and nutrient intake status and eating-out practices of college students. A dietary survey of 361 subjects living in urban areas was conducted by using a 3-day diet record method. The average ages of the male and female subjects were 22.0 and 20.6 years old, respectively. Monthly personal expenses of the male and female students were 316,517 won and 296,888 won, respectively. 43.1% of the male and 50.8% of the female students used between one-quarter and one-half of their monthly personal expenses for eating out. Sixty-five percent of the total subjects ate out more than five times a week. The average daily total food intake was 1630.7g in the males and 1453.9g in the females. The average percentage of total food intake from eating out (by weight) was 60.6% in the males and 56.2% in the females; foods eaten out were mainly potatoes, meats, processed foods, and beverages. It was found that 40-65% of daily total nutrient intake came from food eaten out. When they ate out, the male students ate slightly higher amounts of protein, fat and vitamin B1, while the female students ate relatively higher amounts of animal protein, fat, vitamin A and cholesterol. The more the subjects ate out, the more the quantity of total food intake increased. This increase resulted from high intakes of beverages and processed foods in the males, while the increase was from total plant foods, mushrooms, beverages, and milk and dairy products, in the females. The dietary variety score (DVS) was significantly increased in the female subjects when they ate out more than once a day; otherwise, the DVS was not significantly different between any of the male and female groups. The intakes of energy, and of many nutrients such as protein, fat, carbohydrates, calcium, phosphorus, iron, potassium and cholesterol, were increased when the female subjects ate out more than twice a day. The mean adequacy ratio (MAR) was at its highest level of 0.65 in the males when they ate out less than once a day, and at its highest level of 0.67 in the females when they ate out more than twice a day.

Key word : Eating out, frequency of eating out, food intake, nutrient intake

INTRODUCTION

Recent globalization, along with economic development and more frequent international communications, has promoted a diversification of lifestyles among Koreans. These changes have also influenced the catering industry; for example, toast and hamburgers have to some extent replaced rice as a staple food, and preferences for ketchup, mayonnaise and western spices have emerged[1].

The factors which have influenced changes in eating styles include: 1) loosening of the traditional extended family system, with couples working outside their homes, delayed marriage, increased longevity, and increased preferences for recreation; 2) changes in Koreans' values regarding food; and 3) increased access to alternative foods through the increased availability of private cars and increased incomes[2].

Koreans' expenditures on eating out have significantly increased recently. According to a nutrition survey carried out in 1998, 33.8% of the subjects aged between 20 to 29 years ate out more than once a day[3]. In 1990, the proportion of household expenses used on eating out was 7.0% in urban areas and 3.2% in rural areas, and this increased to 10.4% in urban areas and 4.4% in rural areas in 1999[4]. Thus, it seems clear that foods eaten outside of the household have increasing significance for the health of the nation.

Modern societies make stronger demands on people's time. Especially, college students have a new-found freedom after their demanding high school days; this results in eating out more and having irregular meal patterns which can affect nutrient intakes[5]. In order to sustain their active lifestyles, it is essential for college students to take balanced diets, for example by establishing a regular day-to-day meal pattern. However, Lee[6] et al reported that college students tended to

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consider that lunch was not an important meal of the day.

According to previous studies, College students ate out more frequently (58.7%) compared to salaried workers (47.0%), and more lunches and dinners are eaten out compared to breakfasts[7]. In addition, 57.8% of college students ate out more than once a day[8]. Different food establishments were favored for different functions: campus cafeterias for lunch[9], western food for eating out with the opposite sex, Korean food and pasta dishes for eating out with the same sex or with school friends, and Korean and Chinese foods for eating out with family and friends[8].

A previous study found that daily nutrient intakes of college students were lower than the Korean RDA as follows: 55% for Vitamin A, 96.8% for vitamin B_1, 88.0% for Vitamin B_2, and 96.5% for calcium in the case of male students; and 64.6% for Vitamin A, 90.3% for calcium and 71.0% for iron in the case of female students[9]. One study reported that, among those college students who lived in dormitories or by themselves, the rates of missing meals were higher, more irregular meal patterns were evident, less Korean food was eaten at breakfast, and less balanced meals were consumed[10].

Y N Lee et al showed that nutrient intakes can differ depending on the places where meals are eaten; campus cafeterias and residence hall dining rooms provided the most balanced menus, while for those subjects eating Korean food at home 45.5% had balanced meals, 36.4% lacked in variety, and 9% consumed instant noodles and bread only[10].

In summary, although many studies have been carried out among college students regarding their food habits[11),12], food preferences[13], nutrient intakes[6),9),14)-16], weight control behaviours[17], and eating-out behaviours[8),18)-22], so far no studies have been conducted on the nutrient intakes of college students according to their eating-out behavior.

Therefore, this study was undertaken to determine how food and nutrient intakes are related to the eating-out behavior of college students, in order to identify and analyze problems resulting from the increased incidence of eating-out, and to provide a basis for nutrition education interventions.

STUDY METHODS

1. Subjects and time of the study

A survey of 700 male and female students residing in Seoul and Chun-An was conducted by using a questionnaire. Only the resulting 361 complete responses (98 male and 263 female) were used for data analysis.

2. Survey Methods and contents

1) Items related to eating out

A questionnaire was used to determine the general characteristics and eating-out behavior of the subjects. Frequency, locations, and expenditures on eating out were questioned.

2) Diet survey

Three-day food records were kept by the subjects. Instructions on keeping food records were given prior to the survey, and subjects recorded 3 consecutive days' intakes during week days, with meals eaten out being specified. Food intakes were analyzed by using the CAN-Pro 2.0 program developed by the Nutrition Information Center of the Korean Nutrition Society.

3. Data treatment and analysis

1) Analysis of nutrient intakes

Averages of the three-day food intake results were used to calculate daily nutrient intakes, and the percentages of the Korean RDAs consumed were calculated for each nutrient. In order to evaluate the variety of foods among subjects, the dietary variety score (DVS) was calculated by reference to the numbers of foods eaten. The mean adequacy ratio (MAR) was calculated by averaging the nutrient adequacy ratio (NAR).

All food and nutrient intakes from the meals eaten out in the three recorded days were averaged to obtain mean daily intakes. The average frequency of eating out was calculated, and the food and nutrient intakes were compared as the frequency of eating out increased. Each breakfast, lunch, dinner and snack was calculated as one meal, and a maximum of four meals a day was allowed. The mean daily frequency of eating out was classified into three groups: below 1, 1 to 2, or above 2. The intakes of food and nutrients, and quality of meals, were compared between the three groups.

2) Data Analysis and statistical treatment

Data analysis was carried out by using the SAS package. Means and standard deviations were used for analyzing physical characteristics, monthly income, monthly expenses, and food and nutrient intakes. The T-test was used to test the difference between the male and the female students. Items related to eating out were analyzed by using the χ^2 test. Significance in nutrient intakes was tested by using the T-test and Tukey's student range test. Regarding the levels of significance for nutrient intakes with the frequency of eating out: DVS and MAR were tested by using GLM, and, when significant differences were noted, Tukey's student range test was used for comparison.

RESULTS AND DISCUSSION

1. Physical and general characteristics of subjects

Table 1 summarizes the mean ages and physical characteristics of the subjects. Average ages of the subjects were 22.0 years for the males and 20.6 years for the females. Average heights were 174.8cm for the males and 162.7cm for the females, while average weights were 67.0kg for the males and 52.5kg for the females. Mean BMIs, all within the normal range, were 21.9 kg/m^2 for the males and 19.7 kg/m^2 for the females.

Monthly household income was more than 2 million Won for 70% of the subjects. Subjects' average monthly incomes were 445,333 Won for males and 360,779 Won for females. Mean monthly expenditures were 316,517 Won for males and 296,888 Won for females (Table 2).

Table 1. Physical characteristics of the subjects

	Male(n=98)	Female(n=263)
Age (year)	22.0±2.6[1)]	20.6±1.7
Height (cm)	174.8±4.8	162.7±4.7
Weight (kg)	67.0±8.9	52.5±9.8
BMI (kg/m^2)	21.9±2.5	19.7±2.2

1) Mean±SD

Table 2. Monthly income, monthly expenditure and frequency of eating out per week of the subjects n(%)

		Male	Female
Monthly total income of subject household (10,000won)	< 100	5(5.5)	8(3.5)
	101~200	23(25.2)	53(23.1)
	201~300	36(39.6)	87(38.0)
	301~400	12(13.2)	51(22.3)
	> 401	15(16.5)	30(13.1)
	Total	91(100)	229(100)
Cost rate of eating out in total personal expenses	< 1/4	21(22.3)	36(14.2)
	1/4~1/2	41(43.6)	129(51.0)
	1/2	20(21.3)	53(21.0)
	> 1/2	12(12.8)	35(13.8)
	Total	94(100)	253(100)
Frequency of eating out per week	1~2	13(13.8)	25(9.8)
	3~4	16(17.0)	63(24.7)
	5~6	23(24.5)	83(32.6)
	7~8	23(24.5)	49(19.2)
	> 9	19(20.2)	35(13.7)
	Total	94(100)	255(100)
monthly personal income of subject	(won)	445,333±467,537[1)]	360,779±411,332
monthly personal expenses of subject	(won)	316,517±165,358	296,888±119,968

1) Mean±SD

Table 3. Frequency of eating out per day n(%)

times/day	Male	Female	x^2 - value
<	16(16.3)	57(21.7)	F=6.737
≥1~ <2	51(52.1)	156(59.3)	df=2
≥2	31(31.6)	50(19.0)	P=0.034
Total	98(100.0)	263(100.0)	

2. Eating out practices

The proportions of monthly expenditures spent on eating out were similar in males and females: 43.6% of males and 51.0% of females used one-quarter to one-half of their monthly expenditures on eating out; 21.3% of males and 21.0% of females used one-half; and 12.8% of males and 13.8% of females used more than one half (Table 2). Our results are similar to Roh and Yoo[18)] who reported that 42% of male and 44% of female students living in the Seoul area used 20 to 40% of their monthly expenditures on eating out in 1989.

Eating out 5 to 6 times a week was practiced by 24.5% of the male and 32.6% of the female students. Eating out more than 7 times a week was practiced by 44.7% of the male and 32.9% of the female students. Sixty-five per cent of the subjects ate out about 5 times a week. Table 3 shows that 16.3% of males and 21.7% of females ate out less than once a day, 52.1% of males and 59.3% of females between once and twice a day, and 31.6% of males and 19.0% of females more than twice a day. More than 70% ate out more than once a day. Lee[22)] reported in 1997 that 46% of college students ate out more than 5 times a week, and more recently Kim and Chung[8)] reported that 57.8% of college students ate out more than 7 times a week. Over the last 10 years, College students in general appear to have eaten out at least once a day.

3. Food and nutrient intakes of the subjects

Table 4 presents the food intakes of the subjects. Daily total food intake was 1630.7g for males and 1453.9g for females, among which 987.4g (60.6%) for males and 817.5g (56.2%) for females came from food eaten out. Eating out provided 95% of the processed food intake of males and 83.6% of females. Eating out accounted for 90.5% of the beverages taken by males and 77.0% by females. College students typically take beverages such as carbonated drinks, tea and alcohol outside their homes. The consumption of beverages outside of the home was higher in male students due to their higher intakes of alcohol compared to female students.

Total plant food intakes per day were 851.8g in males and 816.1g in females, with 427.9g (50.2%) in males and 406.8g (49.8%) in females coming from food eaten out. Intakes of cereals, sweets, vegetables and fruits eaten out were similar in male and female students. The

proportion of total fruit intake eaten outside the home was relatively small compared to other plant foods, at 32.1% in males and 33.9% in females. Total animal food intake was 356.9g in males and 350.6g in females, of which 52.3% for males and 54.8% for females came from food eaten out. A slightly higher proportion of the total intake of animal foods is eaten out compared to plant foods; this is because animal food is favored in eating out. Potatoes, meat, processed food, and beverages were the most common foods taken when students ate out.

Nutrient intakes of male and female students are presented in Table 5. Male students had significantly higher daily intakes of protein, carbohydrates, iron, sodium, potassium, riboflavin, niacin and cholesterol compared to female students. Average energy intakes for males and females were 1809.9kcal and 1554.0kcal, respectively, and protein intakes were 69.1g and 52.9g, respectively. According to the Korean nutrition survey conducted in 1998[3], daily calorie intakes of males and females who were 20 to 30 years old were 2424.7kcal and 1872.2kcal, and protein intakes were 91.7g and 67.5g, respectively. Other previous studies carried out on college students reported[9),15),16)] that male students' average intakes of energy and protein were higher than 2200kcal and 80g, respectively, and in females higher than 1600kcal and 60g, respectively. Other nutrient intakes were also lower in the present study compared to the results of the National nutrition survey in 1998[3].

The daily nutrients taken from eating out ranged from 40 to 65% of total consumption, depending on the nutrient. The intakes of plant protein and vitamin B1 in males were 10% higher than in females, and also the intakes of animal protein from eating out were significantly higher in males than in females.

When nutrient intakes were compared with the Korean RDA (Figure 1), only phosphorus was higher than the RDA, with other nutrients being below the RDA. Total daily energy intakes were lower than 80% of the RDA: 72.4% in males and 77.7% in females. The proportions of energy intakes from eating out were not significantly different between males (38.7%) and females (41.7%). Calcium intakes were also below the RDA values: 58.3% in males and 56.5% in females. Consumption of other nutrients at levels below 75% of the RDA were vitamin B1, vitamin B_2, and niacin in males; and iron, vitamin A, vitamin B_1, and vitamin B_2 in females. There were significant differences between males and females in % RDA consumed of energy, phosphorus, and iron. Overall, male students tended to have more nutrient intakes from food eaten out compared to female students. The proportion of nutrient intakes coming from eating out was 40 to 60% in males and 40% to 55% in females. In the case of males, more protein (60.4%) and vitamin B_1(64.4%) intakes came from eating out, compared with eating at home (Figure 1).

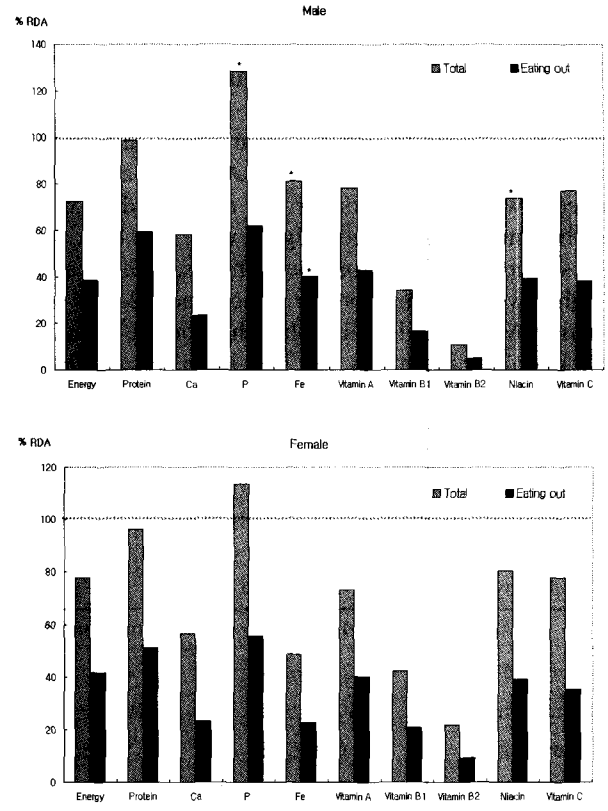

Fig 1. Percent RDA of energy and nutrient intake through whole meals and eating out

* : Significantly different between sex groups at α=0.05 level by Student's t-test

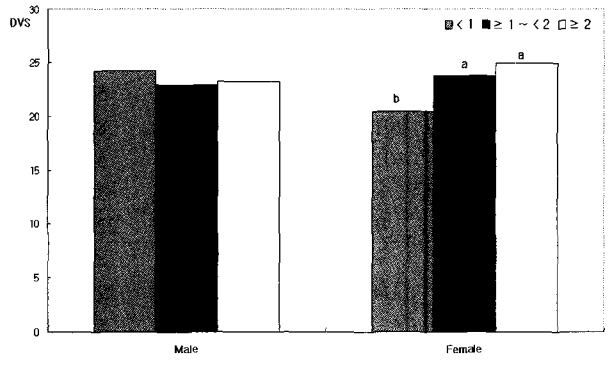

Fig 2. Dietary variety score(DVS) based on the frequency of eating out per day

a, b, c : Values with different superscripts within same sex are significantly different at α=0.05 level by Tukey's studentized range test.

4. Food and nutrient intakes according to eating out frequencies

Table 6 summarizes intakes of food eaten out, according to different food groups. Intakes of total food and food belonging to the miscellaneous group tended to increase as eating out frequencies increased, and this was primarily caused by the increased consumption

Table 4. Food intake through whole meals and the eating out (g/day)

	Male(n=98)		Female(n=263)	
	Total	**Eating out**	**Total**	**Eating out**
Plant Foods	851.8±272.6[1)]	427.9±203.9 (50.2%)[3)]	816.1±255.1	406.8±206.8 (49.8%)
Cereals and grain products	306.8±110.8*	167.0±95.8* (54.4%)	258.9±92.9	145.0±66.3 (56.0%)
Potatoes and starches	36.5±36.9	28.4±38.4 (77.8%)	38.5±45.8	25.7±38.1 (66.8%)
Sugars and sweets	6.8±6.2*	4.1±5.1 (60.3%)	10.7±16.3	4.6±7.5 (43.0%)
Legumes and their products	33.5±34.5	20.4±31.1 (60.9%)	33.1±41.5	18.3±32.9 (55.3%)
Seeds and nuts	6.4±28.4	4.1±24.4 (64.1%)	10.1±63.1	4.4±32.5 (43.6%)
Vegetables	189.0±82.3*	114.7±52.6* (60.7%)	153.1±70.0	90.6±50.3 (59.2%)
Mushrooms	2.4±4.9	1.3±4.1 (54.2%)	3.2±10.0	1.3±7.2 (40.6%)
Fruits	100.1±113.3*	32.1±74.9 (32.1%)	126.7±108.9	43.0±76.4 (33.9%)
Seaweeds	3.8±5.9	1.6±4.5 (42.1%)	3.7±5.9	1.3±3.0 (35.1%)
oils and fats	8.5±3.9	5.4±2.9 (63.5%)	7.8±3.3	5.5±3.1 (70.5%)
Animal Foods	**356.9±155.6**	**186.8±133.9 (52.3%)**	**350.6±142.9**	**192.3±135.3 (54.8%)**
Meat, poultry and their products	82.3±45.8*	65.2±66.2* (79.2%)	67.5±41.6	48.8±40.3 (72.2%)
Eggs	52.8±32.5*	30.4±25.2 (57.6%)	38.7±21.3	26.4±18.8 (68.2%)
Fishes and shell fishes	43.7±42.6	25.3±28.4 (57.9%)	41.7±29.6	24.8±30.1 (59.5%)
Milks and dairy products	161.9±134.0	50.5±90.2 (31.2%)	174.0±108.5	68.2±96.1 (39.2%)
Ready-to-cook products	16.2±47.9	15.4±48.5 (95.0)	28.7±76.2	24.0±69.8 (83.6%)
Other Foods	**422.0±400.5***	**372.7±535.2* (88.3%)**	**287.2±272.7**	**218.3±304.1 (76.0%)**
Beverage[2)]	396.6±401.5*	358.8±534.0* (90.5%)	259.4±270.1	199.7±301.4 (77.0%)
Seasonings	23.1±17.1	13.9±8.3 (60.2%)	19.9±10.7	14.3±9.5 (71.9%)
Total	**1630.7±585.0***	**987.4±675.8* (60.6%)**	**1453.9±464.5**	**817.5±490.2 (56.2%)**

1) Mean±SD
2) Beverage includes soft drink, tea and alcoholic drink.
3) Percentage to daily total intake
* : Significantly different between sex groups at α=0.05 level by Student's t-test.

Table 5. Energy and nutrient intake through whole meals and eating out

	Male(n=98)		Female(n=263)	
	Total	**Eating out**	**Total**	**Eating out**
Energy(kcal)	1809.9±569.3[1)]*	969.1±444.0* (53.5%)[2)]	1554.0±451.2	834.8±368.5 (53.7%)
Protein(g)	69.1±42.5*	41.7±49.0* (60.3%)	52.9±21.2	28.1±18.4 (53.1%)
Animal protein(g)	31.6±12.8*	17.9±12.1* (56.6%)	27.2±11.2	14.9±8.6 (54.8%)
Vegetable protein(g)	37.5±39.9*	23.8±46.4* (63.5%)	25.7±15.2	13.2±14.1 (51.4%)
Fat(g)	48.7±18.0	27.6±20.2 (56.7%)	45.1±16.7	25.8±13.9 (57.2%)
Carbohydrate(g)	266.7±88.9*	132.2±59.2* (49.6%)	229.8±67.4	118.6±50.2 (51.6%)
Ca(mg)	407.5±179.8	166.6 ±102.1 (40.8%)	395.8±178.1	164.1±113.6 (41.5%)
P(mg)	897.1±288.6*	434.8±192.0* (48.5%)	794.8±259.3	387.6±185.6 (48.8%)
Fe(mg)	9.7±6.4*	4.8±4.7* (49.5%)	7.8±4.5	3.6±3.3 (46.2%)
Na(mg)	3592.1±1273.4*	1794.7±777.0* (50.4%)	3041.6±1050.6	1571.1±796.4 (51.7%)
K(mg)	1850.1±625.5*	895.0±377.9 (48.4%)	1699.2±552.6	806.8±387.3 (47.5%)
Vitamin A(RE)	547.7±313.8	300.1±216.7 (54.8%)	512.6±362.2	281.1±165.4 (54.8%)
Vitamin B1(mg)	0.45±0.41	0.22±0.46 (64.4%)	0.42±0.42	0.21±0.32 (50.0%)
Vitamin B2(mg)	0.16±0.26*	0.08±0.24 (50.0%)	0.26±0.38	0.11±0.28 (42.3%)
Niacin(mg)	12.0±4.7*	6.7± 4.2* (55.8%)	10.5±3.6	5.1±2.7 (50.5%)
Vitamin C(mg)	54.0±28.9	26.8±13.6 (49.6%)	54.4±30.5	24.6±18.4 (45.2%)
Cholesterol(mg)	274.7±136.0*	136.7±82.9 (49.8%)	230.9±106.5	129.3±81.9 (55.9%)

1) Mean±SD
2) Percentage to daily total intake
* : Significantly different between sex groups at α=0.05 level by Student's t-test

Table 6. Food intake based on the frequency of eating out per day (g/day)

	Male			Female		
	< 1 (n=16)	≥1~2 (n=51)	≥ 2 (n=31)	< 1 (n=57)	≥1~<2 (n=156)	≥ 2 (n=50)
Plant Foods	**860.2±230.0[1)]**	**858.7±286.8**	**836.2±276.3**	**758.4±265.9[b]**	**811.8±225.5[ab]**	**895.4±309.9[a]**
Cereals and grain products	327.7±115.5	308.7±115.8	292.8±101.1	253.0±92.7	254.7±88.4	278.8±105.8
Potatoes and starches	49.3±34.9	31.8±36.1	37.5±38.9	35.7±39.8	40.1±46.0	36.4±51.6
Sugars and sweets	6.5±4.6	6.2±6.6	8.0±6.3	9.0±12.7	11.5±19.0	10.4±9.8
Legumes and their products	33.2±31.3	32.1±35.3	35.8±35.4	28.8±42.6	36.5±45.0	27.3±24.8
Seeds and nuts	1.2±2.9	4.9±21.6	11.6±42.3	1.9±6.3	7.9±40.5	26.3±125.2
Vegetables	193.8±87.9	195.3±86.4	176.0±72.9	147.5±83.6	157.8±67.1	144.8±61.8
Mushrooms	2.5±5.4	2.9±5.2	1.5±3.9	1.9±5.5[b]	2.8±8.5[ab]	6.1±16.1[a]
Fruits	72.1±59.0	94.7±120.0	123.6±121.5	122.0±111.6	124.7±109.9	138.4±103.7
Seaweeds	5.0±9.3	4.4±6.1	2.1±1.8	3.0±2.2	4.3±7.3	3.0±3.5
oils and fats	9.4±4.1	9.1±4.1	6.9±3.1	7.2±2.6	7.9±3.6	8.4±3.3
Animal Foods	**365.0±188.3**	**371.2±142.9**	**329.3±159.5**	**338.7±158.0**	**341.9±133.2**	**391.3±149.5**
Meat, poultry and their products	98.9±76.6[A]	85.3±37.6[AB]	68.9±33.8[B]	72.1±50.8	62.7±34.7	76.9±47.8
Eggs	52.8±29.8	53.0±36.5	52.4±27.5	40.3±22.7	37.9±21.2	39.4±20.5
Fishes and shell fishes	41.8±36.7	48.0±51.4	37.6±26.9	43.7±32.8	42.9±28.7	35.8±28.2
Milks and dairy products	164.6±128.1	172.9±143.5	142.4±122.2	151.4±126.9[b]	168.0±95.8[b]	218.4±113.3[a]
Ready-to-cook products	6.9±20.2[AB]	11.9±23.6[B]	27.9±77.9[A]	31.1±84.7	30.4±76.9	20.7±63.1
Other Foods	**222.0±158.2[B]**	**415.5±390.6[AB]**	**535.9±465.9[A]**	**227.0±207.4[b]**	**269.7±238.7[b]**	**410.0±384.3[a]**
Beverage[2)]	185.8±151.1[B]	390.0±391.1[AB]	516.3±465.2[A]	208.2±208.2[b]	241.3±234.0[b]	374.1±387.3[a]
Seasonings	36.0±32.9[A]	21.8±11.8[B]	18.7±8.2[B]	18.3±11.7	20.3±10.3	20.8±10.9
Total	**1447.3±436.2**	**1645.3±597.2**	**1701.4±627.4**	**1324.1±450.4[b]**	**1423.4±402.3[b]**	**1702.1±637.0[a]**

1) Mean ± SD
2) Beverage includes soft drink, tea and alcoholic drink.
A, B : Values with different superscripts in the same row of male are significantly different at α=0.05 level by Tukey's studentized range test.
a, b : Values with different superscripts in the same row of female are significantly different at α=0.05 level by Tukey's studentized range test.

of beverages. As eating out frequencies increased, the totalintakes of plant and animal foods tended to decrease in males, but in females total plant food intake was significantly increased and there was a marked increased in beverage consumption.

In the case of males, there was a significant increase in consumption of processed food and a decrease in consumption of the meat group and seasonings, as eating out increased to more than twice a day. It shows that more meat is consumed when eating out compared to home cooking. In the case of females, there was a significant increase in consumption of mushroom, milk, and milk products, as eating out increased to more than twice a day. It appears that there is a difference in food choices when eating out between males and females.

The DVS values were also compared to eating out frequencies (Figure 2). In the case of males, DVS values did not significantly change with eating out frequencies; values were 24.2 for eating out less than once a day, 22.9 for between once and twice, and 23.2 for more than twice a day. However, in females, DVS values increased as eating out frequencies increased; values were 20.4 for less than once a day, 23.8 for between once and twice a day, and 24.9 for more than twice a day. It appears that female students choose a greater variety of foods when eating out, compared to males.

Nutrient intakes are summarized according to eating out frequencies in Table 7. In the case of males, intakes of most nutrients did not change with eating out frequencies, except sodium intake which was lower when they ate out more than twice a day compared to less than once a day. In the case of females, intakes of energy, protein, fats, carbohydrates, calcium, phosphorus, iron, potassium and cholesterol were significantly elevated when they ate out more than twice a day, compared to eating out less than once a day. In male students the increased food intakes with increased eating out frequencies did not influence nutrient intakes, and this can be attributed to increased beverage consumption. On the other hand, female students chose balanced meals when there were eating out.

Figure 3 illustrates the comparison of nutrient intakes

Table 7. Energy and nutrient intake based on the frequency of eating out per day

	Male			Female		
	〈 1 (n=16)	≥1~〈2 (n=51)	≥ 2 (n=31)	〈1 (n=57)	≥1~〈2 (n=156)	≥ 2 (n=50)
Energy(kcal)	1870.6±550.9	1826.1±618.8	1751.8±502.1	1462.0±476.8^{b}	1530.3±413.6^{b}	1732.8±492.9^{a}
Protein(g)	68.2±24.3	73.1±48.18	63.0±40.4	50.8±19.2^{b}	51.3±14.5^{b}	60.6±35.3^{a}
Animal protein(g)	34.3±17.8	32.8±11.6	28.3±11.6	26.6±13.4	26.4±9.3	30.6±13.1
Vegetable protein(g)	33.9±14.8	40.3±47.2	34.7±36.1	24.2±9.3	24.9±8.4	29.9±29.9
Fat(g)	55.0±21.9	47.9±17.1	46.8±17.4	40.9±16.4^{b}	44.2±14.6^{b}	52.8±20.5^{a}
Carbohydrate(g)	272.9±76.9	271.9±100.9	255.1±73.3	219.4±73.9^{b}	227.4±64.7^{ab}	249.2±65.2^{a}
Ca(mg)	463.3±193.5	403.4±178.3	386.8±175.0	335.9±164.9^{b}	394.6±160.9^{b}	468.0±217.3^{a}
P(mg)	984.8±313.3	907.4±299.1	834.7±250.5	742.5±280.5^{b}	786.2±236.3^{ab}	881.6±286.2^{a}
Fe(mg)	8.8±3.6	9.3±6.8	10.8±7.2	7.5±3.7^{b}	7.5±4.3^{b}	8.9±5.7^{a}
Na(mg)	4220.0±1684.3^{A}	3535.3±1207.1^{Ab}	3266.6±1036.4^{B}	2899.2±1038.5	3048.5±1048.5	3182.5±1071.1
K(mg)	2087.1±644.5	1864.3±645.7	1704.4±557.1	1554.8±522.5^{b}	1709.8±529.6^{ab}	1830.7±625.6^{a}
Vitamin A(RE)	515.9±197.7	564.8±341.4	536.0±321.6	435.9±182.8	529.1±439.1	548.6±210.8
Vitamin B1(mg)	0.58±0.55	0.44±0.38	0.39±0.37	0.47±0.49	0.39±0.39	0.48±0.44
Vitamin B2(mg)	0.10±0.20	0.17±0.25	0.18±0.31	0.26±0.34	0.23±0.38	0.35±0.42
Niacin(mg)	12.5±5.6	12.4±4.5	11.2±4.7	10.0±4.1	9.9±3.4	10.6±3.4
Vitamin C(mg)	23.9±25.8	54.5±27.4	51.8±33.1	47.5±24.8	56.2±31.6	56.3±32.2
Cholesterol(mg)	304.8±129.0	282.9±141.1	245.7±129.8	211.9±98.8^{b}	229.8±106.4^{ab}	256.0±112.4^{a}

1) Mean±SD
A, B : Values with different superscripts in the same row of male are significantly different at α=0.05 level by Tukey's studentized range test.
a, b : Values with different superscripts in the same row of female are significantly different at α=0.05 level by Tukey's studentized range test.

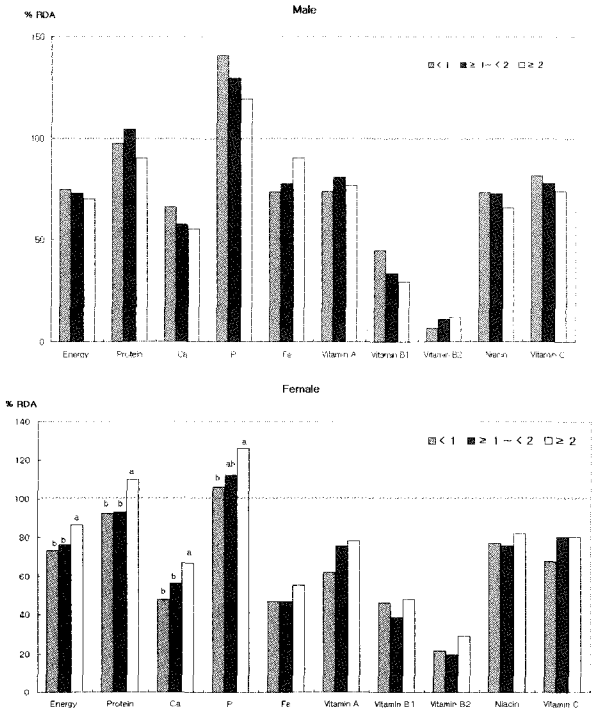

Fig 3. Percent RDA of energy and nutrient intake based on the frequency of eating out per day
a, b : Values with different superscripts within same sex are significantly different at α=0.05 level by Tukey's studentized range test.

with the RDA according to eating out frequencies. In males, phosphorus intake was above the RDA regardless of eating out frequencies, and protein intake reached the RDA when eating out frequencies were between once and twice a day; other nutrient intakes were below the RDA regardless of eating out frequencies. In females, nutrient intakes increased as eating out frequencies increased; energy, protein, calcium and phosphorus intakes were significantly increased when eating out frequencies were more than twice a day. In females, only protein and phosphorus reached the RDA when eating out more than twice a day, while other nutrient intakes were below the RDA, especially vitamin B_2 intakes which were less than 70% of the RDA. It appears that college students may need to be educated on their need to consume more vitamin B_2.

Figure 4 compares MAR values with eating out frequencies. MAR values were 0.61 in males who ate out more than twice a day, and this was slightly lower when they ate out less than once a day. By comparison, in females, MAR values (0.67) were significantly higher when they ate out more than twice a day, compared to less than once a day. Overall, MAR values obtained from both male and female college students were less than 0.7, which can be interpreted as representing their neglect for consuming well balanced meals when they eat out.

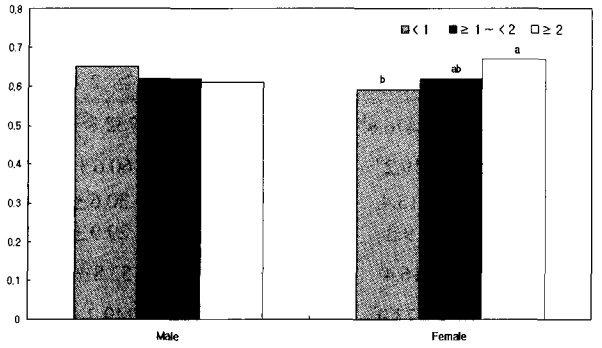

Fig 4. MAR based on the frequency of eating out per day
a, b : Values with different superscripts within same sex are significantly different at α=0.05 level by Tukey's studentized range test.

SUMMARY AND CONCLUSIONS

This study compared food and nutrient intakes among college students according to their eating out frequencies. The results were as follows:

1. Mean ages of subjects were 22.0 years for males and 20.6 years for females. Mean height and weight were respectively 174.8cm and 67.0kg for males, and 162.7cm and 52.5kg for females. Mean BMI was 21.9kg/m^2 for males and 19.7kg/ m^2 for females.

2. Mean monthly expenditures were 316,517 Won in males and 296,888 Won in females. 43.6% of males and 51.0% of the females used one-quarter to one-half of their monthly expenditures on eating out. Sixty-five per cent of the students ate out more than 5 times a week. The three-day food record data showed that 52.1% of males and 59.3% of females ate out between once and twice a day, and 31.6% of males and 19.0% of females ate out more than twice a day.

3. The mean total daily food intakes were 1630.7g in males and 1453.9g in females, and approximately 60% (60.6% in males and 56.2% in females) of these were taken from eating out. Among the food groups, increased animal foods rather than plant foods and miscellaneous foods were consumed by eating out, especially, potatoes, meat, processed food, and beverages.

4. Average intakes of energy were 1809.9kcal in males and 1554.0kcal in females, and those of protein were 69.1g for males and 52.9g for females. Total nutrient intakes coming from eating out ranged from 40% to 65%. Relatively higher proportions of nutrient intakes coming from eating out in males were found for protein, fats, and vitamin B_1, and in females for animal protein, fats, vitamin A and cholesterol.

5. Nutrient intakes were compared with the Korean RDA in males and females; energy consumption was 72.4% and 77.7%, and calcium intake was 58.3% and 56.5%, of the RDA, respectively. Those nutrient intakes which were below 75% of the RDA were vitamin B_1, vitamin B_2 and niacin for males, and vitamin A, vitamin B_1 and vitamin B_2 for females. More than 50% of the RDA for protein and phosphorus were consumed when eating out

6. As the frequency of eating out increased, the total quantity of food intake increased; in males the increase was due to increased beverage and processed food consumption, and in females it was due to increased plant food, mushrooms, beverages, and milk and milk products consumption. DVS values did not change in males, but significantly increased in females, as thefrequency of eating out increased.

7. Nutrient intakes did not change with eating out frequencies in males, but in females a significant increase was seen in energy, protein, fats, carbohydrates, calcium, phosphorus, potassium and cholesterol consumption (as well as % RDA intake) when subjects ate out more than twice a day. However, in females, all the measured nutrients except protein and fat were below the RDA even with eating out frequencies of more than 2.

8. MAR values were highest in males (0.65) who ate out less than once a day, and in females (0.67) who ate out more than twice a day.

In summary, food and nutrient intakes from food eaten out was very significant among college students: 60% of food intake and more than 50% of nutrients per day. There were differences between male and female students in food and nutrient intakes according to their eating out frequencies. Male students preferred beverages and processed food when eating out, and the intakes of these foods significantly increased as the frequency of eating out increased to more than twice a day, while the consumption of other animal protein, plant protein, and other nutrients decreased. This shows that eating out could seriously lower the quality of meals. On the other hand, increases were observed in the DVS and MAR values, and in the % RDA consumed of many nutrients (notably protein, fats, carbohydrates and cholesterol), as eating frequencies increased among female students. As the proportion of meals eaten out by both the young population and the population as a whole continues to grow, active research is warranted in finding and solving nutritional problems caused by this on-going shift in consumption patterns.

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