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A Study on Dietary Habits and Nutrient Intakes of College Students in Gyeonggi Area

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ABSTRACT

This study was performed to investigate dietary habits and nutrient intakes of college students in Gyeonggi-do area. Survey questionnaire and daily intake using 24-hour recall method were recorded by 351 college students (172 males, 179 females). Nutrient intakes were calculated using Can-pro 2.0, from which %RDA (Recommended dietary allowances), NAR (Nutrient adequacy ratio), MAR (Mean nutrient adequacy ratio), and ND (Nutrient density) were calculated to evaluate the quality of diets. Subjects answered 9 questions on dietary habits and these answers were calculated as 0, 0.5, and 1 point by frequency. Dietary habit was 39.57 ± 21.82 in male students and 42.12 ± 20.78 in female students out of total score of 100, showing higher score in female students. In the survey of dietary habits, the ratio of skipping breakfast 6 − 7 days a week in total subjects was 32.9%, showing a rather higher ratio of skipping breakfast, and the interest for balanced diet was as low as 13.2% in total subjects. The importance of meals in total subjects was observed in the order of dinner (47.6%), lunch (40.2%), and breakfast (12.3%). In NAR of total subjects, nutrients with a score lower than 0.70 were calcium (0.64 ± 0.26), vitamin B_2 (0.66 ± 0.25), and vitamin C (0.69 ± 0.29) in ND of them, calcium (0.85 ± 0.43), zinc (0.89 ± 0.18), vitamin B_2 (0.87 ± 0.34), and folic acid (0.91 ± 0.96) were nutrients with lower values. In the evaluation of nutrient intakes by the level of dietary habits, better scores of both NAR and ND were observed as the level of dietary habits was higher. There was a great difference in nutrient intakes in terms of %RDA, suggesting the risk of nutritional imbalance. Based on the above results, it is considered that the improvement in dietary habits will contribute to the improvement of nutrition. (*J Community Nutrition* 7(2) : 71~78, 2005)

KEY WORDS : dietary habits · nutrient intakes · college students.

Introduction

Dietary life, which takes great part in the maintenance of human health, is determined by various social, cultural, and economic lifestyles. Proper dietary life maintains the health of body and mind, prevents diseases, helps normal development of the body, and also takes important roles in maintaining mental and emotional stability (Lee, Han 1996 ; Lye 1993). Dietary life is influenced by social, physical, and mental aspects, in particular, and is greatly influenced by dietary habits (Kim et al. 1992).

College students are in the stage of adolescence moving towards adulthood and also in the period of active physical and mental growth, in which the nutritional condition greatly influences the health of lifetime (Splette, Story 1997 ; Choi et al. 2002). However, college students have had higher frequency of eating out (Oh, Min 2001) and irregular dietary life due to rapid changes of daily life (Seymour et al. 1997). Also, college students have little interest in health (Lee 1999) and do not establish proper values on the importance of dietary life (Lee, Woo 2003) ; thus, they are showing many health-related problems such as increased meal skipping rates and snack-eating, increased drinking and smoking, and improper weight reduction (Kim, Lee 1998 ; Lee, Woo 2003). The importance of nutrition and health in college students with these problems has been fully recognized and the surveys on actual nutritional conditions in college students and dietary habits have been performed actively in foreign countries since 1920. Some studies on dietary habits (Lee, Choi 1994) and actual conditions on nutrient intakes (You et al. 1994) have been

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reported in Korea.

Therefore, this study was performed to investigate the actual condition of overall dietary life through the survey on dietary habits and nutrient intakes in some college students, and to obtain basic data for the nutritional improvement and the proper establishment of dietary habits in college students through the analysis on the influence of dietary habits on nutrient intakes.

Subjects and Methods

1. Subjects

A survey and 24-hour recall method were performed for 351 college students (172 males and 179 females) in Gyeonggi-do area from June 7 to June 18, 2004.

2. General characteristics and dietary habits

Types of residence, health status, and health concerns of study subjects were investigated through survey questionnaire. Subjects answered 9 questions on dietary habits as '0 – 2 days/week', '3 – 5 days/week', and '6 – 7days/week', and these answers were calculated as 0 point for '0 – 2days/week', 0.5 point for '3 – 5days/week', and 1 point for '6 – 7days/week', which were then converted to scores of a 100 point basis. The scores were divided into 3 groups such as Poor group with less than 30, Fair group with scores between 30 – 60, and Good group with over 60 points out of the total of 100 points, and the significance among these groups were evaluated (Chung 2002 ; Shin, Park 1987).

3. Nutrient intakes

A dietary record on one regular meal using 24-hour recall method was directly recorded by study subject. Nutrient intakes and ratios were calculated by using Can-pro 2.0 Professional (The Korean Nutrition Society, 2002). %RDA (Recommended dietary allowances), NAR (Nutrient adequacy ratio), MAR (Mean nutrient adequacy ratio), and ND (Nutrient density) were calculated from nutrient intakes using the 7th Recommended Dietary Allowances for Koreans (The Korean Nutrition Society, 2000) to evaluate the quality of diets in study subjects. In case of NAR, the upper limit was set as 1 and values over 1 were considered as 1.

$$NAR=\frac{\text{Daily intake of nutrient by a subject}}{\text{Recommended allowance for a given nutrient}}$$

Table 1. Anthropometric characteristics of subjects

	Male (n = 172)	Female (n = 179)
Age (yrs)	21.84 ± 3.22[1)]	21.42 ± 3.12
Height (cm)	176.04 ± 5.16	162.28 ± 4.65
Weight (kg)	70.54 ± 10.93	54.29 ± 7.66
BMI[2)] (kg/m^2)	22.81 ± 3.13	20.68 ± 2.55
SBP[3)] (mmHg)	126.18 ± 11.92	111.53 ± 9.85
DBP[4)] (mmHg)	77.26 ± 10.07	70.53 ± 9.55

1) Mean ± S.D.
2) BMI : Body mass index [weight (kg) /height (m^2)]
3) SBP : Systolic blood pressure
4) DBP : Diastolic blood pressure

Table 2. General characteristics of subjects n(%)

	Male (n = 172)	Female (n = 179)	Total (n = 351)	χ^2-value
Type of residence				
Home	82(23.4)	116(33.1)	198(56.6)	
Dormitory	65(18.6)	49(14.0)	114(32.6)	10.789*
Self-boarding	21(6.0)	13(3.7)	34(9.7)	
Relative	3(0.9)	1(0.3)	4(1.1)	
Current health				
Currently sick	3(0.9)	4(1.1)	7(2.0)	
Currently not sick but tired and weak	39(11.1)	61(17.4)	100(28.5)	10.744*
Generally healthy except for common cold	49(14.0)	59(16.8)	108(30.8)	
Perfectly healthy	81(23.1)	55(15.7)	136(38.7)	
Health concern				
Not at all	0(0.0)	4(1.1)	4(1.1)	
Little	8(2.3)	41(3.4)	20(5.7)	6.767NS
Moderate	60(17.1)	63(18.0)	123(35.1)	
Above moderate	90(25.7)	80(22.9)	170(48.6)	
Very much	13(3.7)	20(5.7)	33(9.4)	

* : Significantly different between male and female at $p < 0.05$ by χ^2-test
NS : Not significantly different at $p < 0.05$ by χ^2-test

$$MAR=\frac{\text{Sum of NAR for each nutrient}}{\text{Number of nutrients}}$$

$$ND=\frac{\text{Ratio of intake to RDA for a given nutrient}}{\text{Ratio of intake to recommended energy intake}}$$

3. Statistical analysis

Study data was analyzed by using SPSS (version 11.0). The frequency and % ratio for each questionnaire were calculated and mean and standard deviation were calculated. The significance among variables was verified by using t-test, χ^2-test and ANOVA-test, and the correlation among variables was obtained by using Pearson's correlation coefficient.

Results and Discussion

1. General characteristics

The average ages of study subjects were 21.84 ± 3.22 years in male students and 21.42 ± 3.12 years in female students, the average heights were 176.04 ± 5.16cm in males and 162.28 ± 4.65cm in females, and the average weights were 70.54 ± 10.93kg in males and 54.29 ± 7.66kg in females. The BMI(Body mass index) was 22.81 ± 3.13 in males and 20.68 ± 2.55 in females, showing significantly higher values in males than in females($p < 0.001$), but both groups belonged in normal weight group as the obesity cut point is 25(Table 1) (Kim 2003 ; Yim 1998).

In Table 2, general characteristics of study subjects were investigated for the evaluation of residence type, current health status, and the interest for health. Residence type and current health status showed significant results by gender difference($p < 0.05$).

2. Evaluation on dietary habits

The results of dietary habits showed that the response to the frequency of breakfast was 54.0% for 0 − 2days/week, showing a higher rate of skipping breakfast, and the response to the dietary life with good combination of food was 66.1% for 0 − 2days/week. Fruit intake was high as 45% for 0 − 2 days/week, and the response to milk intake was 215 students for 1 − 2times per week, showing that food intake for balanced nutrient intake was not well practiced. The frequency for seaweed intake was also low(Table 3).

In college students, the major factor that affected the nutritional status or dietary habits has been known as type of residence(Choi et al 2000 ; Park et al. 1995 ; Park 2003), which

Table 3. Food habits of subjects n(%)

	0 − 2day/ week	3 − 5day/ week	6 − 7day/ week
Frequency of breakfast	189(54.0)	46(13.1)	115(32.9)
Meal with proper amount	91(26.1)	128(36.7)	130(37.2)
Meal with good combination of foods	230(66.1)	72(20.7)	46(13.2)
Dark green/yellow vegetables intake	139(39.7)	114(32.6)	97(27.7)
Fruits intake	157(45.0)	93(26.6)	99(28.4)
Vegetables intake	75(21.5)	110(31.4)	165(47.1)
Protein foods intake	106(30.3)	123(35.1)	121(34.6)
Milk intake	215(61.4)	49(14.0)	86(24.6)
Seaweed intake	244(70.3)	77(22.2)	26(7.5)

Table 4. Food habits group by demographic characteristics n(%)

	Food habits group			χ^2-value
	Poor	Fair	Good	
Sex				
Male	62(17.7)	76(21.7)	34(9.7)	2.798^{NS}
Female	50(14.2)	92(26.2)	37(10.5)	
Type of residence				
Home	44(12.6)	106(30.3)	48(13.7)	
Dormitory	52(14.9)	44(12.6)	18(5.1)	24.454***
Self-boarding	16(4.6)	14(4.0)	4(1.1)	
Relative	0(0.0)	3(0.9)	1(0.3)	
Current health status				
Sick	0(0.0)	7(2.0)	0(0.0)	
Not sick but tired	33(9.4)	45(12.8)	22(6.3)	13.061*
Generally healthy	29(8.3)	60(17.1)	19(5.4)	
Perfectly healthy	50(14.2)	56(16.0)	30(8.5)	
Health concern				
Not at all	1(0.3)	3(0.9)	0(0.0)	
Little	12(3.4)	7(2.0)	1(0.3)	17.338*
Moderate	44(12.6)	60(17.1)	19(5.4)	
Above moderate	49(14.0)	82(23.4)	39(11.1)	
Very much	6(1.7)	16(4.6)	11(3.1)	
Total	112(31.9)	168(47.9)	71(20.2)	

*, *** : Significantly different between male and female at $p < 0.05$, $p < 0.001$ by χ^2-test
NS : Not significantly different at $p < 0.05$ by χ^2-test

was consistent in this study. These results reflected that nutritional education in home is important. In case of students commuting from their home, Fair group was 30.3% and Good group was 13.7%, which were twice more than students in dormitory (5.1%) or self-boarding (1.1%). In dietary habits, current health status and health concerns were significantly different ($p < 0.05$) (Table 4).

3. Nutrient intake

The results on the analysis of NAR for the evaluation of the overall quality of meals showed that calorie intake was significantly higher in males as 0.83 ± 0.18 when compared to that in females, and proteins, calcium, phosphorus, iron, zinc, vitamin B_1, vitamin B_6, vitamin E, and niacin were significantly higher in males than in females, and also the intake of other nutrients was higher in males. Nutrients with lower NAR values less than 0.70 were calcium, vitamin B_2, vitamin C, and folic acid, among which calcium intake was the lowest. This was similar to other results in adults over 40 years old by Lee et al. (2004) and in college students by Lee, Chang (2003) and Lee et al. (1998), but showed higher calcium intake than those in other studies. The MAR was 0.89 ± 0.16

Table 5. Nutrient intakes as NAR and MAR by gender

		Male	Female	Total	p-value
NAR	Energy	0.83 ± 0.18[1)]	0.72 ± 0.21	0.78 ± 0.20	<0.0001***
	Protein	0.96 ± 0.10	0.86 ± 0.18	0.91 ± 0.16	<0.0001***
	Calcium	0.71 ± 0.24	0.58 ± 0.26	0.64 ± 0.26	<0.0001***
	Phosphorus	0.95 ± 0.12	0.86 ± 0.19	0.90 ± 0.16	<0.0001***
	Iron	0.97 ± 0.37	0.64 ± 0.22	0.80 ± 0.24	<0.0001***
	Zinc	0.75 ± 0.20	0.65 ± 0.22	0.70 ± 0.22	<0.0001***
	Vitamin A	0.72 ± 0.30	0.70 ± 0.30	0.71 ± 0.30	0.627NS
	Vitamin B_1	0.85 ± 0.21	0.78 ± 0.23	0.81 ± 0.22	0.003**
	Vitamin B_2	0.68 ± 0.25	0.65 ± 0.25	0.66 ± 0.25	0.258NS
	Vitamin B_6	0.93 ± 0.14	0.85 ± 0.19	0.89 ± 0.18	<0.0001***
	Vitamin C	0.68 ± 0.30	0.71 ± 0.29	0.69 ± 0.29	0.363NS
	Vitamin E	0.81 ± 0.27	0.71 ± 0.31	0.76 ± 0.29	0.001**
	Niacin	0.82 ± 0.21	0.77 ± 0.22	0.79 ± 0.22	0.034*
	Folate	0.70 ± 0.25	0.65 ± 0.25	0.67 ± 0.25	0.054NS
MAR		0.89 ± 0.16	0.78 ± 0.21	0.83 ± 0.20	<0.0001***

1) Mean ± S.D.
*, **, *** : Significantly different between male and female at $p < 0.05$, $p < 0.01$, $p < 0.001$ by t-test
NS : Not significantly different at $p < 0.05$ by t-test

Table 6. Nutrient intakes as ND by gender

	Male	Female	Total	p-value
Protein	1.52 ± 0.31[1)]	1.38 ± 0.33	1.45 ± 0.33	<0.0001***
Calcium	0.87 ± 0.45	0.84 ± 0.41	0.85 ± 0.43	0.489NS
Phosphorus	1.53 ± 0.40	1.40 ± 0.37	1.46 ± 0.39	0.002**
Iron	1.84 ± 1.20	0.95 ± 0.54	1.39 ± 1.03	<0.0001***
Zinc	0.89 ± 0.19	0.89 ± 0.16	0.89 ± 0.18	0.787NS
Vitamin A	1.08 ± 0.84	1.15 ± 0.76	1.12 ± 0.80	0.432NS
Vitamin B_1	1.22 ± 0.43	1.21 ± 0.37	1.22 ± 0.40	0.753NS
Vitamin B_2	0.81 ± 0.33	0.92 ± 0.34	0.87 ± 0.34	0.002**
Vitamin B_6	1.52 ± 0.55	1.40 ± 0.41	1.46 ± 0.48	0.022*
Vitamin C	1.04 ± 0.82	1.24 ± 0.87	1.14 ± 0.85	0.030*
Vitamin E	1.58 ± 1.11	1.22 ± 0.74	1.39 ± 0.96	<0.0001***
Niacin	1.12 ± 0.44	1.17 ± 0.36	1.14 ± 0.40	0.210NS
Folate	0.87 ± 0.43	0.95 ± 0.42	0.91 ± 0.43	0.082NS

1) Mean ± S.D.
*, **, *** : Significantly different between male and female at $p < 0.05$, $p < 0.01$, $p < 0.001$ by t-test
NS : Not significantly different at $p < 0.05$ by t-test

Table 7. Nutrient intakes as %RDA by gender

	Male	Female	Total	p-value
Energy	95.20 ± 35.78[1)]	77.02 ± 31.08	85.93 ± 34.63	<0.0001***
Protein	144.04 ± 65.79	104.52 ± 44.86	123.89 ± 59.42	<0.0001***
Calcium	78.99 ± 41.23	62.81 ± 35.93	70.74 ± 39.40	<0.0001***
Phosphorus	144.99 ± 71.21	105.23 ± 44.08	124.71 ± 62.14	<0.0001***
Iron	166.78 ± 108.76	69.81 ± 29.03	117.33 ± 94.16	<0.0001***
Zinc	84.20 ± 38.37	68.11 ± 29.03	75.99 ± 34.83	<0.0001***
Vitamin A	99.69 ± 81.17	86.87 ± 59.40	93.15 ± 71.09	0.091NS
Vitamin B_1	118.98 ± 66.75	94.22 ± 2.18	106.35 ± 60.95	<0.0001***
Vitamin B_2	78.83 ± 47.04	70.99 ± 39.30	74.83 ± 43.38	0.090NS
Vitamin C	96.26 ± 76.76	88.91 ± 57.94	92.51 ± 67.82	0.311NS
Vitamin E	157.84 ± 163.98	94.38 ± 69.45	125.48 ± 128.84	<0.0001***
Niacin	108.60 ± 74.20	89.70 ± 46.19	98.96 ± 63.17	0.004**
Folate	80.41 ± 46.52	70.49 ± 35.95	75.35 ± 41.70	0.026*

1) Mean ± S.D.
*, **, *** : Significantly different between male and female at $p < 0.05$, $p < 0.01$, $p < 0.001$ by t-test
NS : Not significantly different at $p < 0.05$ by t-test

in males and 0.78 ± 0.25 in females, showing significant lower values in female students. Lower values of females in the MAR resulted from less intakes in most nutrients. It was thought that female students showed deep concern at weight control, therefore food consumption was decreased and nutrient intakes became poor. When compared to the MAR value of 0.73 − 0.87 by gender and ages in the analyzed data of the U.S. National Food Consumption Survey 1977 − 1978 (Murphy et al. 1992), the MAR in this study was slightly higher in males but appropriate as a whole (Table 5).

As the result observed in NAR values, ND was the lowest for calcium and highest for phosphorus and vitamin B_6 as 1.46. The lowest in males was vitamin B_2 (0.81 ± 0.33) and the lowest in females was calcium (0.84 ± 0.41). The nutrient with the greatest difference in ND depending on gender was iron, and also significant differences by gender were observed in protein, phosphorus, vitamin B_2, vitamin B_6, vitamin C, and vitamin E (Table 6).

Table 7 showed %RDA was significantly different depending on gender, particularly in iron and vitamin E. In case of iron, the intake ratio in females was lower than that in males despite the higher requirements for females. Nutrients with the intake of lower than 75% of RDA were calcium and vitamin B_2. The intakes of calcium (62.81 ± 35.93) and iron (69.81 ± 37.90) were very low in female students and the intakes of iron and vitamin E showed greater standard deviations, suggesting that individuals either over-consumed or under-consumed these nutrients.

4. Relationship between dietary habits and nutrient intake

The result on the analysis of NAR by the level of dietary habits was shown in Fig. 1 and Table 8. The nutrients showing significant differences in nutrient intakes by the level

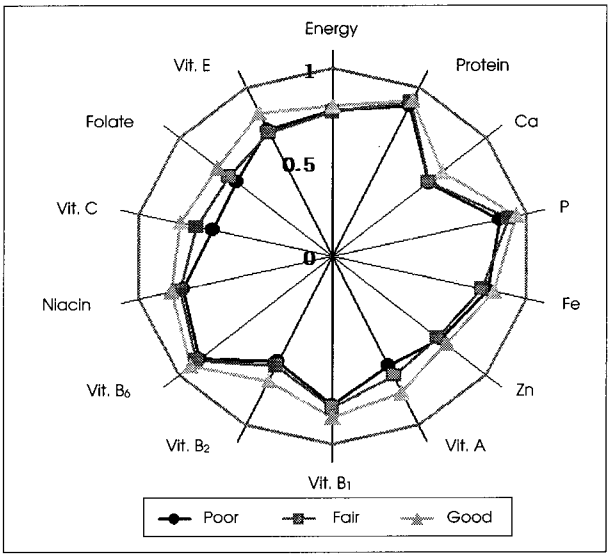

Fig. 1. Nutrient intakes as NAR by food habits.

Table 8. Comparison of nutrient adequacy ratio (NAR) and mean nutrient adequacy ratio (MAR) by dietary habits group

	Dietary habits group			p-value
	Poor	Fair	Good	
NAR				
Energy	0.78 ± 0.22[1)]	0.77 ± 0.19	0.80 ± 0.19	0.580[NS]
Protein	0.89 ± 0.17	0.91 ± 0.16	0.93 ± 0.16	0.238[NS]
Calcium	0.62 ± 0.26[a2)]	0.63 ± 0.25[a]	0.71 ± 0.25[b]	0.032[*]
Phosphorus	0.87 ± 0.19[a]	0.91 ± 0.17[ab]	0.95 ± 0.11[b]	0.010[*]
Iron	0.81 ± 0.26	0.78 ± 0.23	0.84 ± 0.21	0.264[NS]
Zinc	0.70 ± 0.24	0.69 ± 0.20	0.74 ± 0.20	0.180[NS]
Vitamin A	0.65 ± 0.31[a]	0.71 ± 0.30[a]	0.81 ± 0.26[b]	0.002[**]
Vitamin B_1	0.79 ± 0.24	0.81 ± 0.22	0.86 ± 0.19	0.132[NS]
Vitamin B_2	0.63 ± 0.28[a]	0.65 ± 0.24[a]	0.74 ± 0.24[b]	0.012[*]
Vitamin B_6	0.87 ± 0.19	0.88 ± 0.18	0.93 ± 0.13	0.070[NS]
Vitamin C	0.62 ± 0.31[a]	0.70 ± 0.29[a]	0.79 ± 0.23[b]	0.001[**]
Vitamin E	0.75 ± 0.30[a]	0.73 ± 0.30[a]	0.85 ± 0.25[b]	0.009[**]
Niacin	0.78 ± 0.23	0.79 ± 0.22	0.84 ± 0.20	0.146[NS]
Folate	0.63 ± 0.26[a]	0.67 ± 0.24[a]	0.75 ± 0.24[b]	0.005[**]
MAR	0.80 ± 0.22[a]	0.83 ± 0.20[a]	0.89 ± 0.16[b]	0.006[**]

1) Mean ± S.D.
2) Values with different superscripts are significantly different at p = 0.05 by Duncan's multiple range test
*, ** : Significantly different between male and female at p < 0.05, p < 0.01 by ANOVA test
NS : Not significantly different at p < 0.05 by ANOVA test

of dietary habits were calcium and phosphorus, vitamin A, vitamin B_2, vitamin C, vitamin E, and folic acid, particularly greater significance in vitamins ($p < 0.01$). The NAR was increased as the level of dietary habits became better. The MAR was 0.80 ± 0.22 in Poor group and 0.83 ± 0.20 in Fair group, and Good group showed significant differences by the level of dietary habits ($p < 0.01$). The ND showed lower significance with dietary habits than NAR, and showed significant differences in calcium, phosphorus, vitamin B_1, vitamin B_2, vitamin C, and folic acid (Fig. 2 and Table 9). The %RDA did not show significant differences by the level of dietary habits, but showed distinct imbalance among nutrient intakes as shown in Fig. 3 and Table 10.

The correlation between ND and dietary habits shown in Table 12. Phosphorus, vitamin B_2, and folate showed higher positive correlation coefficient, and protein, calcium, vitamin C, and vitamin A showed statistically significant correlations

Summary and Conclusions

This study was performed to investigate the nutritional knowledge, dietary habits and actual condition of nutrient in-

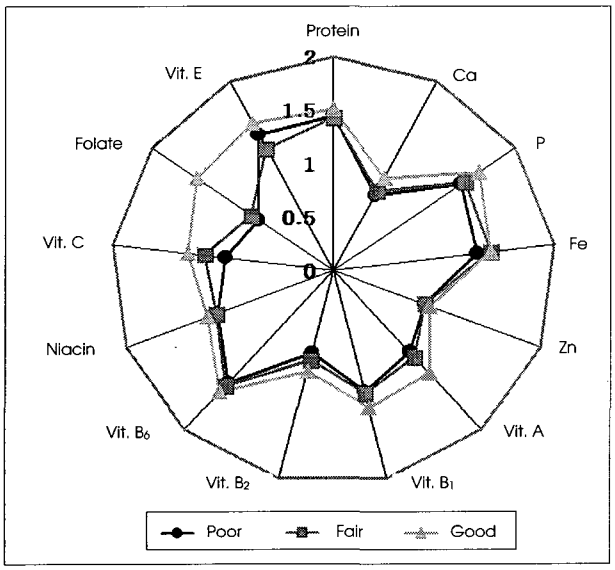

Fig. 2. Nutrient intakes as ND by food habits.

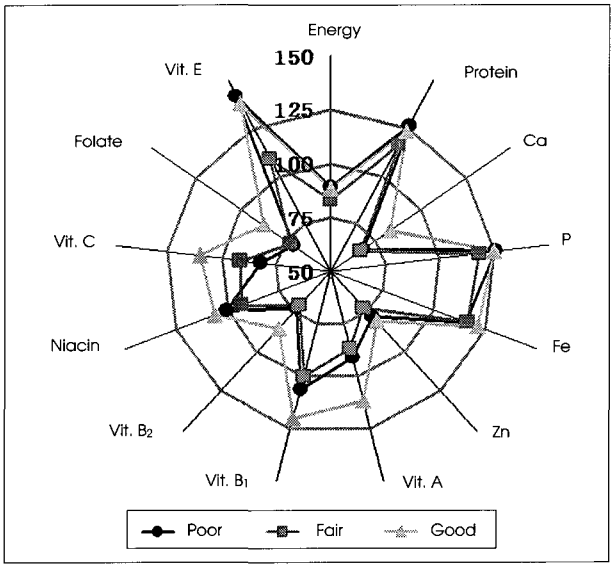

Fig. 3. Nutrient intakes as %RDA by food habits.

Table 9. Comparison of nutrient density (ND) by dietary habits group

	Dietary habits group			p-value
	Poor	Fair	Good	
Protein	1.44 ± 0.40[1)]	1.43 ± 0.29	1.52 ± 0.28	0.109[NS]
Calcium	0.80 ± 0.40[a2)]	0.84 ± 0.37[a]	0.98 ± 0.55[b]	0.014[*]
Phosphorus	1.40 ± 0.40[a]	1.44 ± 0.36[a]	1.60 ± 0.42[b]	0.002[**]
Iron	1.31 ± 0.80	1.43 ± 1.24	1.43 ± 0.76	0.594[NS]
Zinc	0.88 ± 0.21	0.88 ± 0.16	0.93 ± 0.15	0.184[NS]
Vitamin A	1.03 ± 0.83	1.10 ± 0.78	1.30 ± 0.78	0.073[NS]
Vitamin B_1	1.17 ± 0.40[a]	1.19 ± 0.39[a]	1.33 ± 0.40[b]	0.017[*]
Vitamin B_2	0.80 ± 0.32[a]	0.87 ± 0.32[a]	0.97 ± 0.38[b]	0.003[**]
Vitamin B_6	1.42 ± 0.52	1.45 ± 0.46	1.53 ± 0.50	0.322[NS]
Vitamin C	0.99 ± 0.84[a]	1.17 ± 0.89[ab]	1.33 ± 0.76[b]	0.026[*]
Vitamin E	1.45 ± 1.12	1.28 ± 0.87	1.56 ± 0.84	0.089[NS]
Niacin	1.12 ± 0.45	1.13 ± 0.39	1.22 ± 0.35	0.240[NS]
Folate	0.83 ± 0.41[a]	0.91 ± 0.39[a]	1.05 ± 0.50[b]	0.003[**]

1) Mean ± S.D.
2) Values with different superscripts are significantly different at p = 0.05 by Duncan's multiple range test
* : Significantly different between male and female at $p < 0.05$ by ANOVA test
NS : Not significantly different at $p < 0.05$ by ANOVA test

Table 10. Comparison of %RDA by dietary habits group

	Dietary habits group			p-value
	Poor	Fair	Good	
Energy	89.01 ± 39.37[1)]	82.83 ± 31.78	88.38 ± 32.96	0.275[NS]
Protein	126.68 ± 70.76[ab2)]	117.11 ± 49.21[a]	135.47 ± 60.61[b]	0.077[NS]
Calcium	68.23 ± 39.29[a]	67.16 ± 33.22[a]	83.17 ± 49.85[b]	0.011*
Phosphorus	125.41 ± 76.67[ab]	118.15 ± 50.89[a]	139.15 ± 59.11[b]	0.057[NS]
Iron	115.25 ± 85.96	116.95 ± 108.79	121.52 ± 65.99	0.906[NS]
Zinc	78.07 ± 41.74	72.44 ± 30.33	81.11 ± 32.31	0.159[NS]
Vitamin A	90.69 ± 87.45[a]	86.77 ± 56.90[a]	112.13 ± 70.32[b]	0.037*
Vitamin B_1	106.42 ± 63.21[ab]	100.37 ± 56.57[a]	120.41 ± 65.70[b]	0.067[NS]
Vitamin B_2	73.46 ± 49.80[a]	71.28 ± 38.47[a]	85.39 ± 42.41[b]	0.065[NS]
Vitamin C	82.30 ± 69.88[a]	91.59 ± 66.07[a]	110.81 ± 65.83[b]	0.020*
Vitamin E	142.20 ± 179.78	109.04 ± 98.83	138.00 ± 84.76	0.071[NS]
Niacin	101.35 ± 79.12	93.75 ± 52.09	107.53 ± 52.68	0.261[NS]
Folate	72.00 ± 49.59[a]	72.35 ± 33.99[a]	87.73 ± 42.95[b]	0.019*

1) Mean ± S.D.
2) Values with different superscripts are significantly different at p = 0.05 by Duncan's multiple range test
* : Significantly different between male and female at $p < 0.05$ by ANOVA test
NS : Not significantly different at $p < 0.05$ by ANOVA test

Table 11. Correlation coefficient between NAR(nutrient adequacy ratio) and food habits

		Food habits
NAR	Energy	−0.005
	Protein	0.082
	Calcium	0.107*
	Phosphorus	0.153**
	Iron	0.026
	Zinc	0.039
	Vitamin A	0.178**
	Vitamin B_1	0.062
	Vitamin B_2	0.128*
	Vitamin B_6	0.108*
	Vitamin C	0.200***
	Vitamin E	0.138**
	Niacin	0.099
	Folate	0.181**
MAR		0.103

*, **, *** : Significantly different at $p < 0.05$, $p < 0.01$, $p < 0.001$ by Pearson's correlation coefficient

takes of college students in Gyeonggi-do area. A survey questionnaire on general characteristics and dietary habits, and daily intake using 24-hour recall method of a day were recorded by 351 college students(172 males, 179 females). Nutrient intakes and ratios were calculated using Can-pro 2.0, from which %RDA(Recommended dietary allowances), NAR (Nutrient adequacy ratio), MAR(Mean nutrient adequacy ratio), and ND(Nutrient density) were calculated to evaluate the quality of diets in subjects.

Table 12. Correlation coefficient between nutrient density(ND) and food habits

	Food habits
Protein	0.122*
Calcium	0.145**
Phosphorus	0.205***
Iron	0.056
Zinc	0.097
Vitamin A	0.152**
Vitamin B_1	0.141**
Vitamin B_2	0.195***
Vitamin B_6	0.105*
Vitamin C	0.150**
Vitamin E	0.039
Niacin	0.116*
Folate	0.205***

*, **, *** : Significantly different at $p < 0.05$, $p < 0.01$, $p < 0.001$ by Pearson's correlation coefficient

1) The average ages of study subjects were 21.84 ± 3.22 in male students and 21.42 ± 3.12 in female students, and the average heights were 176.04 ± 5.16cm in males and 162.28 ± 4.65cm in females, and the average weights were 70.54 ± 10.93kg in males and 54.29 ± 7.66kg in females. The BMI was 22.81 ± 3.13 in males and 20.68 ± 2.55 in females, showing significantly higher values in males than in females ($p < 0.001$), but both groups belonged in normal weight group.

2) Dietary habit was 39.57 ± 21.82 in male students and 42.12 ± 20.78 in female students out of total score of 100 though not significantly different, but showed significance

statistically with type of residence, health concerns, and current health status. In the survey of dietary habits, the ratio of skipping breakfast was 32.9%, showing rather higher ratio of skipping breakfast, and significantly different with the type of residence.

3) In the analysis of actual condition of nutrient intakes, nutrients with the NAR less than 0.70 were calcium (0.64 ± 0.26), vitamin B_2 (0.66 ± 0.25), and vitamin C (0.69 ± 0.29) MAR was 0.83 ± 0.20 showing slightly lower quality of overall diets ; nutrients with lower ND were calcium (0.85 ± 0.43), zinc (0.89 ± 0.18), vitamin B_2 (0.87 ± 0.34), and folic acid (0.91 ± 0.96). %RDA was lower in calcium and the standard deviation was greater, suggesting that the level of individual intake was significantly different.

4) The actual condition of nutrient intakes by the level of dietary habits showed that NAR and ND were better as dietary habits became better and the %RDA did not show significant differences by the level of dietary habit, but in general, "Good group" showed more proper intake of nutrients.

Based on the above results, it was confirmed that the improvement of dietary habits could improve nutritional condition. Therefore, it is considered that the effect of improved nutrition in college students will be expected through the improvement in dietary habits

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