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Comparison of Dietary Calcium and Iron Intake in Young Men Living Alone or Living with Roommates*

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ABSTRACT

A survey was performed to 238 male young men who were living alone(104 persons) or living with roommates (134 persons). Their average age was 22.6 years old, height 171.8cm, and weight 65.6kg. Their daily calcium intake level was averaged 271.9 ± 169.1mg, which was 38.8% of Korean Recommended Dietary Allowances(RDA). Comparing calcium intake of each mealtime, breakfast, lunch, dinner, and snacks were composed of 18.6%, 30.0%, 34.0% and 17.4%, respectively. Their daily iron intake level was averaged 8.9 ± 10.8mg, which was 74.3% of Korean RDA. Comparing iron intake of each mealtime, breakfast, lunch, dinner, and snacks were composed of 15.4%, 33.6%, 36.3% and 14.7%, respectively. Deficiency of these minerals in young male adults were severe and the nutrient qualities were also poor and the deficiency was more profound in calcium than in iron. And we observed iron nutrition differed significantly according to their living status, such as iron intake and its %RDA were significantly worse in single living subjects than the other. However calcium did not show significant difference. It was found mineral intake, especially iron, could be improved in young men living with roommates than living alone and regular breakfast could improve calcium and iron intakes. (*J Community Nutrition* 4(3) : 159~5163, 2002)

KEY WORDS : young male adults · calcium intake · iron intake · living alone · living with roommate.

Introduction

Dynamic equilibrium of calcium continues so that bone mass grows to reach over 90% of maximum bone mass at the age of 20s and a peak at the age of late 30s. there are many reports supporting that calcium intake enhances bone mass to be maximized(Kim, Yoon 1991 ; Oh et al. 1996). Since maximizing bone mass is a major determinant for osteoporosis prevention, enough calcium intake in childhood is stressed more. Calcium is one of the most deficient nutrient in the ordinary Korean diet since daily calcium intakes were 516 − 550mg in male adults and 477 − 510mg in female adults by '98 National Health and Nutrition Survey(Health & Welfare Dept., Korea). Iron is absorbed at low proportion such as 11.2% of the intake in Korean healthy adults(Kye, Paik 1993) and influenced by iron intake level and types in the foods, iron storage level in body, other affecting dietary components(dietary fiber, alcohol drinking, smoking), etc. (Nam et al. 1998). Calcium and iron hinder the absorption each other in terms of their levels and ratio(Hallberg et al. 1992 ; Lee, Lee 2000). Anemia due to iron deficiency has been reported in children and young female adults in Korea (Lee et al. 1997 ; Son, Yang 1997), which could lead to low appetite, diminished memory, depression and weak immunity (Knekt et al. 1994). In order to maximize bone mass and to improve hemoglobin concentrations, calcium and iron supplements have been recommended especially for adolescents and young female adults(NIH 1994). However male adults were reported as low in anemia prevalence(Cartwright, Lee 1971), Korean men seemed to need calcium and iron supplement and they actually took supplements as much as over 20%(Park, Kim 1997).

There are a tendency recently in young adults to live independently from family, because of commuting problems or other reasons. Most college students become free after long restricted lifestyles, which leads to deteriorated diets. The nutritional status of elderly living alone was shown as lower

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value of INQ and larger % of poor quality (INQ < 1) of calcium than living with their family, and as similar of iron nutrition in both (Kim, Park 2000). There were limited reports on nutritional status of young college students by residence (Choi et al. 2000 ; Park et al. 1997), but male students, who could have very dynamic lifestyle, might have serious nutritional problems. In this study we investigated young men to compare calcium and iron intakes and their food sources in their ordinary diets between living alone and living with roommates. On the basis of these findings we suggested food habits and dietary environment for young men to improve calcium and iron nutrition.

Subjects and Methods

1. Subjects and periods

The subjects were 250 male students attending a college in Chungnam Province. Collected data were examined to screen uncompleted ones and 238 data were selected (104 of living alone and 134 of living with roommates). The average age of the subjects was 22.6 years old. The survey was conducted from May 25 to June 8, 2001.

2. Methods and data analysis

A survey questionnaire was prepared after studying previous studies. The 24-hour dietary recall survey was recorded through personal interviews by sophomore and graduate students who were previously educated carefully. They recorded dish names, food names and sizes for 1 day as breakfast, lunch, dinner and snack intakes. For more accurate information they called or met the subjects. Food intakes was calculated using CAN program for nutrient intakes. The data were analyzed statistically using SPSS for Win program in order to get proportion (%), mean, Chi-square or Student t-test.

Results and Discussion

1. General characteristics of the subjects

General characteristics of the subjects are shown in Table 1. Their age was averaged as 22.6 year old (21.9 year and 23.2 year old in living alone and with roommates, respectively). And their height was averaged as 171.8cm (169.6cm and 173.6cm in living alone or with roommates, respectively) and the weight 65.6kg (64.1kg and 66.8kg in living alone and with roommates, respectively), which were less when comparing the values (174cm, 67kg) refereed in RDA (Korean Nutrition Society 2000). I was observed that young men living with roommates were significantly older, taller and heavier than ones living alone ($p < 0.001$). Their BMI was

Table 1. Age and physical measurements of the subjects by living status

	Alone (n = 104)	With roommate (n = 134)	Total (n = 238)	Sig.
Age (yr)	21.9 ± 6.0	23.2 ± 2.7	22.6 ± 4.5	***
Height (cm)	169.6 ± 64.6	173.6 ± 4.8	171.8 ± 42.8	***
Weight (kg)	64.1 ± 18.6	66.8 ± 8.1	65.6 ± 13.7	***
BMI (kg/m^2)	22.0 ± 3.4	22.2 ± 2.4	22.1 ± 2.8	ns

Mean ± SD
*** : Significant difference observed at $p < 0.001$ between 'alone' and 'with roommates'

Table 2. Dietary calcium and iron intakes of daily and each mealtime and %RDA

		Alone		With roommate		Total		Sig.
		Intake (mg)	%	Intake (mg)	%	Intake (mg)	%	
Ca	Daily (%RDA)	248.7 ± 128.5 (35.5 ± 18.4%)	100 %	278.8 ± 179.3 (39.8 ± 25.6%)	100 %	271.9 ± 169.1 (38.8 ± 20.4%)	100 %	-
	Breakfast	75.9 ± 87.2	28.6 ± 27.7	47.3 ± 83.3	15.3 ± 22.4	53.9 ± 84.8	18.6 ± 24.4	
	Lunch	56.6 ± 60.5	23.9 ± 24.1	78.3 ± 70.9	31.6 ± 23.0	73.3 ± 69.1	30.0 ± 23.4	-
	Dinner	73.4 ± 68.6	30.9 ± 25.5	86.7 ± 79.5	34.6 ± 23.9	83.7 ± 77.1	34.0 ± 24.2	
	Snacks	42.9 ± 81.5	16.6 ± 23.5	66.5 ± 130.2	18.5 ± 24.5	61.0 ± 121.0	17.4 ± 24.3	
Fe	Daily (%RDA)	6.0 ± 2.4 (50.4 ± 20.4%)	100	9.8 ± 12.0 (81.5 ± 100.7%)	100	8.9 ± 10.8 (74.3 ± 89.8%)	100	*
	Breakfast	1.6 ± 1.5	25.4 ± 24.6	1.1 ± 1.5	12.5 ± 18.5	1.3 ± 1.5	15.4 ± 20.7	
	Lunch	1.7 ± 1.3	29.6 ± 24.7	2.8 ± 4.6	34.8 ± 23.6	2.6 ± 4.1	33.6 ± 23.9	*
	Dinner	2.3 ± 1.6	38.4 ± 24.0	3.1 ± 4.1	35.6 ± 23.0	2.9 ± 3.7	36.3 ± 23.2	
	Snacks	0.4 ± 0.9	6.6 ± 11.7	2.8 ± 10.5	17.1 ± 23.9	2.3 ± 9.2	14.7 ± 22.1	

Mean ± SD
* : Significant difference observed at $p < 0.05$ between 'alone' and 'with roommate' by ANOVA

22.1kg/m^2 (22.0 and 22.2 in living alone or with roommates, respectively), that was in normal range of 20 – 25.

2. Daily intakes and %RDA of calcium and iron

Calcium intake in ordinary diets shown in Table 2 was 271.9mg (38.8% of RDA, 700mg), which is seriously low, and the group living with roommates revealed a somewhat improved level than those living alone with no significance. When comparing calcium intake by mealtime, calcium supply was more than sufficient in dinner (34.0%) and lunch (30.0%) but less than sufficient in snacks (17.4%) and breakfast (18.6%). The low supply in breakfast might be contributable to skipping it. There was no difference in calcium intake of each meal between two groups, but in living alone group it seemed like relatively higher in breakfast than at other mealtimes and in living with roommates group relatively higher in lunch than other mealtimes .

Iron intake in ordinary diets shown in Table 3 was 8.9mg (74.2% of RDA, 12mg), which is also seriously low, and the group living with roommates revealed significantly improved level than the group living alone. For latter, young men living alone, the consumption of iron was deficient, as much as 50% of RDA. When comparing iron intake by mealtime, iron consumption was large in dinner (36.3%) and lunch (33.6%) but small in snacks (14.7%) and breakfast (15.4%). Like calcium, low consumption in breakfast might be caused of skipping it and there was no difference in calcium intake of each meal between two groups.

It was found that mineral intake, especially iron could be improved in young men living with roommates than living alone and regular breakfast could improve calcium and iron intakes. Furthermore when one need additional eating of foods or tablets, we suggest the intake be around breakfast for mineral balance among mealtimes.

3. Quality and deficiency of dietary calcium and iron

To evaluate calcium quality INQ (Index of Nutritional Quality) was calculated and is shown in Table 3. The proportion of calcium INQ < 1 (means poor quality) was 86.8% (82.5% and 88.1% in living alone and with roommates, respectively). And the proportion of iron INQ < 1 was 63.2% (57.5% and 64.7% in living alone and with roommates, respectively). The group living with roommates revealed more poor dietary calcium and iron quality than the other.

When applying deficiency as the level of less than 75% RDA, the calcium-deficient population was 94.2% including 72.4% of serious deficiency (less than 50% RDA). This could be due to specific conditions like the survey season, recording errors, etc., however we should see the possibility of a common problem in young adults, with the lifestyle of living alone. The iron-deficient population was 81.8%, including 35.8% of serious deficiency (less than 50% RDA), that was fortunately less than calcium.

Table 3. Dietary calcium and iron quality and deficiency in young men (%)

	Evaluation		Alone	With roommate	Total
Ca	INQ < 1		82.5 %	88.1 %	86.8 %
	%RDA	< 50%	75.0 %	71.6 %	72.4 %
		50 – 75%	22.5 %	21.6 %	21.8 %
		75 – 100%	2.5 %	6.8 %	5.8 %
		≥ 100%	–	–	–
Fe	INQ < 1		57.5 %	64.9 %	63.2 %
	%RDA	< 50%	52.5 %	44.0 %	46.0 %
		50 – 75%	40.0 %	23.9 %	35.8 %
		75 – 100%	7.5 %	32.1 %	25.4 %
		≥ 100%	–	–	–

No significant difference was observed between 'alone' and 'with roommates' by ANOVA

There was no significant difference in calcium intake between two groups. However, the roommate group showed better quantity (deficiency) of calcium and iron intake than the alone group. But their qualities were worse, which might be attributed to the large food consumption (unpublished data). These results suggested to stimulate nutritional information and education programs for young adults.

4. Animal and plant sources of dietary calcium and iron

Animal and plant sources of calcium in ordinary diets of the subjects were 61% and 39%, respectively, so that the animal calcium was doubled to the plant calcium with no difference between two groups (Table 4). It was well known that calcium-rich foods like milk, milk products and small fishes were animal source.

Animal and plant sources of iron in ordinary diets were 67% and 33%, respectively (Table 4). The composition was significantly different between two groups, such that the alone group consumed more animal iron (meats, etc.) and less plant iron (green vegetables, etc.) than the roommate group. When comparing calcium or iron source by mealtimes, the plant source was concentrated to dinner, but animal sou-

Table 4. Calcium and iron source of daily and each mealtime intakes

	Intake	Alone		With roommate		Total		Sig.
		Animal source	Plant source	Animal source	Plant source	Animal source	Plant source	
Ca	Daily(mg)	127.3 ± 145.4 (38.9 ± 23.4%)	144.5 ± 81.1 (61.1 ± 23.5%)	104.1 ± 95.5 (36.9 ± 24.4%)	144.4 ± 80.6 (63.1 ± 24.7%)	134.2 ± 156.9 (39.4 ± 23.2%)	144.5 ± 81.6 (60.6 ± 23.2%)	–
	Breakfast	26.2 ± 35.8	28.8 ± 28.5	17.6 ± 29.6	13.1 ± 19.3	19.6 ± 31.3	16.7 ± 22.7	
	Lunch	27.0 ± 37.5	28.4 ± 26.4	30.2 ± 32.8	35.3 ± 23.9	29.5 ± 33.1	33.7 ± 24.6	
	Dinner	26.3 ± 36.1	37.3 ± 25.9	32.5 ± 32.6	37.7 ± 24.3	31.0 ± 33.4	37.6 ± 24.6	*
	Snacks	20.5 ± 36.8	5.5 ± 9.5	19.7 ± 32.0	13.9 ± 18.7	19.9 ± 33.1	12.0 ± 17.4	
	Total	100%	100%	100%	100%	100%	100%	
Fe	Daily(mg)	1.9 ± 1.2 (29.6 ± 14.7%)	4.3 ± 2.0 (70.8 ± 16.5%)	3.1 ± 3.5 (33.3 ± 16.0%)	6.9 ± 11.4 (66.7 ± 16.9%)	2.8 ± 3.1 (32.6 ± 16.5%)	6.3 ± 10.1 (67.4 ± 16.8%)	*
	Breakfast	26.3 ± 30.1	25.1 ± 25.6	14.7 ± 25.0	12.3 ± 18.6	17.4 ± 26.7	15.2 ± 21.1	
	Lunch	29.3 ± 32.4	30.8 ± 26.0	37.1 ± 29.5	34.4 ± 24.4	35.3 ± 30.3	33.6 ± 24.7	
	Dinner	32.2 ± 31.9	39.0 ± 24.8	37.4 ± 29.0	34.9 ± 24.6	36.2 ± 29.7	35.9 ± 24.7	–
	Snacks	12.2 ± 25.9	5.0 ± 9.0	10.8 ± 19.5	18.4 ± 25.3	11.1 ± 21.1	15.3 ± 23.3	
	Totals	100%	100%	100%	100%	100%	100%	

Mean ± SD
* : Significant difference observed at $p < 0.05$ between 'alone' and 'with roommates' by ANOVA

rce was evenly spread.

Summary and Conclusion

The study was performed with male college students in Chungnam Province from May 25 to June 8, 2001. Data of 238 subjects(104 of living alone and 134 of living with roommate) was obtained by questionnaires and the 24-hour dietary recall for a day was analyzed using their physical measurements and dietary calcium and iron status. The findings were as follows :

1) Calcium intake in ordinary diets was 271.9mg(38.8% of RDA). In mealtimes of breakfast, lunch, dinner and snacks, calcium intakes were spread by 18.6%, 30.0%, 34.0% and 17.4%, respectively. Iron intake in ordinary diets was 8.9mg(74.2% of RDA). In mealtimes of breakfast, lunch, dinner and snacks, iron intake was spread by 15.4%, 33.6%, 36.3% and 14.7%, respectively.

2) Calcium and iron intakes were seriously low in quality and quantity. Their poor conditions were even serious for calcium than iron, which might be due to skipping breakfast, etc..

3) The roommate group showed improved quantity but worse quality of dietary calcium and iron, which might be attributed to the larger meal size. And the alone group showed relatively higher proportion in breakfast than other mealtimes whereas the roommate group higher in lunch. Animal/plant source ratio of calcium in ordinary diets was 2/3 roughly and that of iron was 1/2. The alone group consumed more animal calcium and less animal iron than the other.

Therefore, I suggest that young adults should eat more foods and more calcium and iron, especially when living alone, and they should not miss their breakfasts. Nutritional information and education programs for the young adults must include the emphasis to consume these mineral-rich foods.

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