J Food Sci Nutr
Vol 10, p 179~186 (2005)

J Food Science and Nutrition

Gender and Age Differences in Dietary Behaviors and Food Consumption Pattern of Korean Americans Living in Western Parts of USA

Hee-Kyung Ro[1†] and Connie Georgiou[2]

[1]Department of Food & Nutrition, Chosun University, Gwangju 501-795, Korea
[2]Department of Nutrition and Food Management, Oregon State University, Corvallis, Oregon 97331, USA

Abstract

This study was conducted to find the gender and age differences in dietary behaviors and food consumption pattern of Korean American adults living in western parts of USA. The structured survey forms and self-administered food frequency questionnaire were used to assess dietary behavior and nutrient intakes. It was found that younger subjects kept their meal time more irregularly and skipped breakfast more often than older subjects due to lack of time. There were significant age differences in skipping meals, kind of skipping meals, and the reasons for skipping meals. Young subjects consumed more American type food while older subjects consumed more traditional Korean food. Nutrient intakes of males' except for the elderly were significantly higher in energy, protein, Fe and P than those of females'. Vitamin A and vitamin C intake were significantly higher in females. Energy ratio of carbohydrate : protein : fat was 56.2 : 16.8 : 27.0. Females consumed more plant food as their dietary sources of protein, fat, Ca and Fe, compared to males. Ca intakes of participants' were below 75% of RDA except for the youngest male and 30~49 aged male and females. Futhermore, Ca intake was below 70% after age 50 in both genders. Effective nutrition education program targeting Korean Americans in the community should be developed and implemented to increase Ca consumption.

Key words: dietary behavior, nutrient intake, nutrition education program

INTRODUCTION

Dietary intake and nutritional factors have been associated with major leading causes of death such as hypertension, coronary heart disease, cancer, cardiovascular disease, chronic liver disease and type II diabetes mellitus in the United States as well as in Korea (1,2). Thus, the role of diet and nutrition in health and disease is of concern.

The Asian Pacific Islander population in the US is expected to increase more than double its number from 4% in 1999 to 9% of the US population by 2050 (3). Among them, more than 1.3 million Korean Americans have lived in the US since Korean immigrants arrived in Hawaii in 1903 (4). As Korean immigrant population is growing dramatically these days, information on cultural food habits and dietary pattern of Korean Americans is needed in order that dietetics professionals may understand cultural practices of their diet (5). This information, when collected, will provide health care workers and policy makers a better picture of how to solve different diet related health problems of Korean Americans in the community.

However, little is known about dietary intake and nutritional factors in this population. Since dietary behavior and food consumption pattern may be influenced from different subcultures and life styles between genders and age groups even in the same population, this study was done to find gender and age differences in dietary behaviors and food consumption pattern related to health factors within Korean Americans. Findings from this study will help solve different diet related health problems of this population in the community.

MATERIALS AND METHODS

Subjects and experimental design

277 participants were recruited from Korean Americans living in the state of Washington, Oregon and California. Subjects were interviewed or asked to fill out survey form. Among volunteer subjects most elderly subjects were interviewed. A letter used to recruit participants was sent to every household of Korean Americans with the survey form. This study was approved by the

†Corresponding author. E-mail: hkno@chosun.ac.kr
Phone: +82-62-230-7723, Fax: +82-62-225-7726

University's Institutional Review Board, Human Subjects in Research at Oregon State University.

The structured survey forms contain demographic information, data on food habits and health-related factors. Self-administered food frequency questionnaire was devised to obtain information on usual food intake over an extended period. Sixty seven food items in food frequency questionnaire are those consumed frequently in Korea (2) and the United States (6). The survey forms including food frequency questionnaire were prepared either in English or Korean.

Nutrient intake analysis was done with the CAN program (7) and food composition tables provided by US Department of Agriculture (8) and compared with American RDA.

Statistical analysis

Statistical package for social science (SPSS) procedures were used to compute mean, frequency and standard deviation. One-way ANOVA, x^2-test were used to find the statistical significance between two groups. A probability value of 0.05 was chosen as the level of statistical significance.

RESULTS AND DISCUSSION

General characteristics of the sample

Demographic characteristics of 277 respondents are presented in Table 1. Sample consisted of 99 men (35.7%) and 178 women (64.3%). 28.5% of subjects were 30~49 years and 27.4% were above 65 years. More than 50% of subjects aged over 50 years lived in the US for more than 20 years, regardless of gender. Generally, most subjects lived in the US more than 10 years. 89.8% of participants were born in Korea. From the youngest group, only 30.8% of male and 40.5% of female were born in USA.

Dietary behavior

Table 2 shows dietary behavior of the subjects. 57.1% of subjects, regardless of gender and age, kept their meal time regularly. The younger the age, the more irregular their meal time was. However, the older subjects kept their meal time more regularly than young ones. In the study, males kept their meal time more regularly than females but this tendency was not demonstrated in the youngest group.

Skipping meal was significantly widespread among young respondents rather than old respondents. It seems breakfast is skipped and neglected by most subjects. However, some older females skipped dinner. The youngest group indicated that they skipped the meal due to lack of time, lost of appetite, diet and habitual behavior. On the other hand, the elderly group indicated that the major reasons for skipping meals were lost of appetite and habitual behavior. There were significant age differences in skipping meals and the kind of meals skipped among subjects. Furthermore, significant age differences in the reasons for skipping meals were found.

Regarding fat-related behavior, young adults cared

Table 1. Demographic characteristics of subjects by gender and age

	Gender		Age (yr)				x^2
			18~29	30~49	50~64	≥65	
Length of residence (yr)	Male	<5	2 (7.7)	2 (8.0)	4 (20.0)	1 (3.6)	39.197**
		5~9	4 (15.4)	2 (8.0)	3 (15.0)	2 (7.1)	
		10~19	8 (30.8)	14 (56.0)	1 (5.0)	9 (32.1)	
		≥20	12 (46.2)	7 (28.0)	12 (60.0)	16 (57.1)	
		Total	26 (100.0)	25 (100.0)	20 (100.0)	28 (100.0)	
	Female	<5	7 (18.9)	12 (22.2)	2 (5.1)	0 (0.0)	
		5~9	3 (8.1)	4 (7.4)	4 (10.3)	5 (10.9)	
		10~19	11 (29.7)	22 (40.7)	10 (25.6)	18 (39.1)	
		≥20	16 (43.2)	16 (29.6)	23 (59.0)	23 (50.0)	
		Total	37 (100.0)	54 (100.0)	39 (100.0)	46 (100.0)	
Birth place	Male	US	8 (30.8)	1 (4.0)	0 (0.0)	0 (0.0)	83.823***
		Korea	17 (65.4)	24 (96.0)	20 (100.0)	28 (100.0)	
		Others	1 (3.8)	0 (0.0)	0 (0.0)	0 (0.0)	
		Total	26 (100.0)	25 (100.0)	20 (100.0)	28 (100.0)	
	Female	US	15 (40.5)	1 (1.9)	0 (0.0)	0 (0.0)	
		Korea	21 (56.8)	53 (98.1)	38 (97.4)	48 (100.0)	
		Others	1 (2.7)	0 (0.0)	1 (2.6)	0 (0.0)	
		Total	37 (100.0)	54 (100.0)	39 (100.0)	48 (100.0)	

**$p<0.01$, ***$p<0.001$.

Table 2. Dietary behavior of subject by gender and age N (%)

	Gender		Age (yr) 18~29	30~49	50~64	≥65	x^2
Regularity of meals	Male	Yes	8 (30.8)	18 (72.0)	14 (70.0)	23 (82.1)	36.178***
		No	18 (69.2)	7 (28.0)	6 (30.0)	5 (17.9)	
		Total	26 (100.0)	25 (100.0)	20 (100.0)	28 (100.0)	
	Female	Yes	13 (35.1)	25 (47.2)	19 (50.0)	37 (77.1)	
		No	24 (64.9)	28 (52.8)	19 (50.0)	11 (22.9)	
		Total	37 (100.0)	53 (100.0)	38 (100.0)	48 (100.0)	
Skipping of meals/day	Male	Yes	15 (57.7)	10 (40.0)	5 (25.0)	4 (14.3)	17.475*
		No	11 (42.3)	15 (60.0)	15 (75.0)	24 (85.7)	
		Total	26 (100.0)	25 (100.0)	20 (100.0)	28 (100.0)	
	Female	Yes	16 (43.2)	24 (44.4)	16 (41.0)	12 (25.0)	
		No	21 (56.8)	30 (55.6)	23 (59.0)	36 (75.0)	
		Total	37 (100.0)	54 (10.0)	39 (100.0)	48 (100.0)	
Kind of meals skipped	Male	Breakfast	14 (93.3)	11 (91.7)	4 (80.0)	4 (100.0)	23.933*
		Lunch	1 (6.7)	1 (8.3)	1 (20.0)	0 (0.0)	
		Diner	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
		Total	15 (100.0)	12 (100.0)	5 (100.0)	4 (100.0)	
	Female	Breakfast	17 (94.4)	21 (84.0)	14 (63.6)	8 (47.1)	
		Lunch	1 (5.6)	1 (4.0)	3 (13.6)	4 (23.5)	
		Diner	0 (0.0)	3 (12.0)	5 (22.7)	5 (29.4)	
		Total	18 (100.0)	25 (100.0)	22 (100.0)	17 (100.0)	
Reason for skipping meals	Male	Lack of time	5 (29.4)	5 (38.5)	2 (40.0)	0 (0.0)	43.965
		No appetite	5 (29.4)	1 (7.7)	2 (40.0)	1 (25.0)	
		Indigestion	0 (0.0)	2 (15.4)	0 (0.0)	0 (0.0)	
		Diet	2 (11.8)	1 (7.7)	0 (0.0)	1 (25.0)	
		Habitual behavior	3 (17.6)	3 (23.1)	1 (20.0)	2 (50.0)	
		Oversleep	1 (5.9)	0 (0.0)	0 (0.0)	0 (0.0)	
		Others	1 (5.9)	1 (7.7)	0 (0.0)	0 (0.0)	
		Total	17 (100.0)	13 (100.0)	5 (100.0)	4 (100.0)	
	Female	Lack of time	7 (38.9)	4 (15.4)	7 (33.3)	0 (0.0)	
		No appetite	5 (27.8)	3 (11.5)	3 (14.3)	7 (46.7)	
		Indigestion	0 (0.0)	3 (11.5)	0 (0.0)	0 (0.0)	
		Diet	2 (11.1)	5 (19.2)	4 (19.0)	2 (13.3)	
		Habitual behavior	1 (5.6)	8 (30.8)	7 (33.3)	4 (26.7)	
		Oversleep	1 (5.6)	2 (7.7)	0 (0.0)	0 (0.0)	
		Others	2 (11.1)	1 (3.8)	0 (0.0)	2 (13.3)	
		Total	18 (100.0)	26 (100.0)	21 (100.0)	15 (100.0)	
Trimming fat from meat	Male	Almost	4 (15.4)	6 (24.0)	7 (35.0)	12 (44.4)	53.995***
		Roughly	11 (42.3)	13 (52.0)	11 (55.0)	12 (44.4)	
		No	11 (42.3)	6 (24.0)	2 (10.0)	3 (11.1)	
		Total	26 (100.0)	25 (100.0)	20 (100.0)	27 (100.0)	
	Female	Almost	20 (54.1)	20 (37.0)	16 (41.0)	31 (66.0)	
		Roughly	16 (43.2)	29 (53.7)	21 (53.8)	16 (34.0)	
		No	1 (2.7)	5 (9.3)	2 (5.1)	0 (0.0)	
		Total	37 (100.0)	54 (100.0)	39 (100.0)	47 (100.0)	
Use of salt shaker	Male	Always	4 (15.4)	4 (16.0)	1 (5.0)	5 (17.9)	18.402
		Frequently	14 (53.8)	12 (48.0)	5 (25.0)	14 (50.0)	
		Never	8 (30.8)	9 (36.0)	14 (70.0)	9 (32.1)	
		Total	26 (100.0)	25 (100.0)	20 (100.0)	28 (100.0)	
	Female	Always	4 (10.8)	4 (7.4)	2 (5.1)	3 (6.3)	
		Frequently	22 (59.5)	25 (46.3)	17 (43.6)	20 (41.7)	
		Never	11 (29.7)	25 (46.3)	20 (51.3)	25 (52.1)	
		Total	37 (100.0)	54 (100.0)	39 (100.0)	48 (100.0)	

*$p<0.05$, ***$p<0.001$.

less on trimming even visible fat from meat than elderly. However, there was no significant age difference in the use of salt shaker. In the present study, overall older people were more conscious of healthy dietary behaviors than younger people.

Table 3 presents meal type of subjects by gender and age. The oldest subjects favored Korean type food consumption for breakfast, while the youngest subjects favored American type food consumption for breakfast and lunch, regardless of gender. American meals were convenient to consume during the busy times of morning and afternoon as immigrants became more acculturated to American society (9-11). For dinner, Korean meals were favored among 68.4% of subjects. The younger the age, the more they like both Korean and American food for dinner. Some studies in other Asian ethnicities investigated that immigrants were more likely to consume their traditional food for dinner, whereas breakfast and lunch were more to be westernized (10-14). In the present study, young subjects consumed more American type food, while old subjects consumed more traditional type food. It is evident that older people still strongly prefer traditional food patterns, while a shift toward preference of both American and Korean foods is noted to the younger people. These result showed unchanged dietary behavior among elderly, while younger people quickly adopted American food habits and became more acculturated to American society. This is consistent with other findings (15-18).

Nutrient intakes

Nutrient intakes by gender and age were compared and shown in Table 4. Significant gender difference was shown consistently with the age groups under 50 in carbohydrate, P and Fe intakes. Surprisingly nutrient in

Table 3. Food pattern of subjects by gender and age N (%)

	Gender		Age (yr) 18~29	30~49	50~64	≥65	x^2
Breakfast	Male	Korean	2 (8.7)	10 (41.7)	4 (21.1)	9 (33.3)	40.476**
		Korean+American	10 (43.5)	6 (25.0)	3 (15.8)	8 (29.6)	
		American	10 (43.5)	5 (20.8)	10 (52.6)	7 (25.9)	
		Others	1 (4.3)	3 (12.5)	2 (10.5)	3 (11.1)	
		Total	23 (100.0)	24 (100.0)	19 (100.0)	27 (100.0)	
	Female	Korean	4 (11.4)	12 (22.6)	5 (13.9)	25 (53.2)	
		Korean+American	14 (40.0)	17 (32.1)	11 (30.6)	9 (19.1)	
		American	15 (42.9)	18 (34.0)	17 (47.2)	11 (23.4)	
		Others	2 (5.7)	6 (11.3)	3 (8.3)	2 (4.3)	
		Total	35 (100.0)	53 (100.0)	36 (100.0)	47 (100.0)	
Lunch	Male	Korean	1 (3.8)	8 (32.0)	8 (40.0)	10 (35.7)	68.885***
		Korean+American	10 (38.5)	8 (32.0)	8 (40.0)	14 (50.0)	
		American	15 (57.0)	7 (28.0)	4 (20.0)	3 (10.7)	
		Others	0 (0.0)	2 (8.0)	0 (0.0)	1 (3.6)	
		Total	26 (100.0)	25 (100.0)	20 (100.0)	28 (100.0)	
	Female	Korean	4 (10.8)	12 (22.2)	15 (38.5)	28 (59.6)	
		Korean+American	15 (40.5)	32 (59.3)	16 (41.0)	16 (34.0)	
		American	17 (45.9)	8 (14.8)	7 (17.9)	3 (6.4)	
		Others	1 (2.7)	2 (3.7)	1 (2.6)	0 (0.0)	
		Total	37 (100.0)	54 (100.0)	39 (100.0)	47 (100.0)	
Dinner	Male	Korean	11 (42.3)	18 (72.0)	17 (85.0)	23 (82.1)	60.137***
		Korean+American	12 (46.2)	6 (24.0)	3 (15.0)	4 (14.3)	
		American	3 (11.5)	1 (4.0)	0 (0.0)	0 (0.0)	
		Others	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.6)	
		Total	26 (100.0)	25 (100.0)	20 (100.0)	28 (100.0)	
	Female	Korean	15 (40.5)	34 (63.0)	27 (71.1)	43 (91.5)	
		Korean+American	21 (56.8)	18 (33.3)	9 (23.7)	1 (2.1)	
		American	1 (2.7)	1 (1.9)	1 (2.6)	0 (0.0)	
		Others	0 (0.0)	1 (1.9)	1 (2.6)	3 (6.4)	
		Total	37 (100.0)	54 (100.0)	38 (100.0)	47 (100.0)	

**p<0.01, ***p<0.001.

Table 4. Nutrient intakes by gender and age

	Age (yr)	Gender		F
		Male	Female	
Energy	18~29	2705.4±233.3[1)a2)]	1978.5±333.7[bdg]	20.129***
	30~49	2499.4±630.4[ac]	2088.1±311.6[be]	
	50~64	2192.1±231.4[bc]	1895.1±319.9[def]	
	≥65	1889.6±267.0[bf]	1818.9±217.9[fg]	
Protein (kcal)	18~29	111.4±13.7[a] (192.1±23.7)[3)]	77.9±16.7[b] (169.3±36.3)	8.889*** (6.319***)
	30~49	103.1±30.1[ac] (163.7±47.8)	91.5±18.8[bcd] (182.9±37.6)	
	50~64	98.7±17.5[ade] (156.7±27.8)	81.3±17.6[b] (162.6±35.3)	
	≥65	84.7±18.9[be] (134.5±29.9)	81.5±15.2[b] (163.1±30.4)	
Fat (g)	18~29	95.7±18.4[a]	68.3±15.2[bc]	16.146***
	30~49	83.6±28.6[ac]	67.1±16.6[b]	
	50~64	64.4±16.1[bd]	56.4±2.9[be]	
	≥65	54.3±14.4[be]	50.9±15.4[de]	
Carbohydrate (g)	18~29	354.7±41.7[a]	276.0±64.0[bc]	8.348***
	30~49	345.2±81.3[a]	294.5±45.9[bc]	
	50~64	314.1±41.4[ac]	278.3±56.9[bc]	
	≥65	277.1±47.5[bc]	277.3±30.4[bc]	
Calcium (mg)	18~29	869.1±259.8 (86.9±26.0)	712.2±307.6 (71.2±30.8)	1.024 (4.575***)
	30~49	790.0±257.6 (79.0±25.8)	791.3±201.2 (79.1±20.1)	
	50~64	792.3±195.0 (66.0±16.2)	740.3±181.2 (61.7±15.1)	
	≥65	742.5±235.6 (61.9±19.6)	810.1±224.6 (67.5±18.7)	
Phosphorus (mg)	18~29	1611.7±288.7[a] (230.3±32.7)	1200.6±322.9[b] (171.5±46.1)	4.426*** (4.426***)
	30~49	1501.9±407.0[ac] (214.6±58.1)	1392.8±303.1[ab] (199.0±43.3)	
	50~64	1410.7±264.6[ab] (201.5±37.8)	1254.0±269.2[bc] (179.1±38.5)	
	≥65	1280.2±310.8[bc] (182.9±44.4)	1304.7±262.1[bc] (186.4±37.4)	
Iron (mg)	18~29	18.4±2.0[a] (229.6±25.0)	14.6±4.8[a] (81.1±26.6)	5.681* (54.448***)
	30~49	19.4±6.5[ab] (242.8±81.8)	17.9±4.0[a] (99.5±22.0)	
	50~64	19.3±4.2[ab] (241.5±52.9)	17.2±4.2[a] (215.2±52.5)	
	≥65	18.0±5.7[a] (225.0±70.9)	18.4±4.1[ab] (230.2±51.7)	
Vitamin A (R.E)	18~29	1071.9±471.8 (119.1±52.4)	974.4±525.9 (140.4±76.5)	1.185 (3.259**)
	30~49	1182.7±581.1 (131.4±64.6)	1284.2±494.1 (183.5±70.6)	
	50~64	1174.0±613.3 (130.4±68.1)	1317.9±540.9 (188.3±77.3)	
	≥65	1376.5±1042.4 (152.9±115.8)	1295.6±620.0 (185.1±88.6)	

Table 4. Continued

	Age (yr)	Gender		F
		Male	Female	
Vitamin B_1 (mg)	18~29	2.4±0.4[a] (197.0±31.4)	1.7±0.6[bc] (150.5±52.7)	4.903*** (3.319**)
	30~49	2.1±0.7[ab] (174.2±55.6)	1.9±0.5[bc] (171.8±46.3)	
	50~64	1.9±0.6[abc] (165.1±49.9)	1.8±0.5[bc] (165.1±43.5)	
	≥65	1.7±0.5[bc] (142.4±38.2)	1.7±0.4[c] (151.5±33.1)	
Vitamin B_2 (mg)	18~29	2.2±0.5[a] (171.9±34.6)	1.6±0.6[b] (147.6±56.3)	3.588** (3.013**)
	30~49	1.9±0.6[ab] (146.0±49.0)	1.8±0.5[ab] (163.5±45.7)	
	50~64	1.8±0.7[ab] (139.6±52.6)	1.6±0.4[b] (145.9±37.0)	
	≥65	1.6±0.4[b] (120.2±41.4)	1.6±0.5[b] (146.9±40.2)	
Niacin (mg)	18~29	30.3±5.1[a] (189.5±31.9)	20.4±6.5[b] (145.8±46.5)	5.420*** (3.698**)
	30~49	26.1±9.5[ab] (163.0±59.2)	24.5±6.7[b] (175.3±48.1)	
	50~64	26.1±6.8[ab] (162.9±42.3)	23.3±5.3[b] (166.4±37.9)	
	≥65	21.8±5.7[b] (136.4±35.7)	21.4±5.2[b] (152.7±37.1)	
Vitamin C (mg)	18~29	225.8±108.9 (250.9±121.0)	281.5±177.6 (375.4±236.8)	1.939 (4.257***)
	30~49	272.0±138.6 (302.2±154.0)	338.3±142.9 (451.1±190.5)	
	50~64	298.9±173.9 (332.1±193.2)	355.7±163.0 (474.2±217.4)	
	≥65	300.3±154.8 (344.5±157.6)	345.3±150.9 (451.3±214.5)	

[1)]Mean±SD.
[2)]Different superscripts are significantly different in the same row at *$p<0.05$, **$p<0.01$, ***$p<0.001$ by Duncan's multiple range test.
[3)]% RDA.

takes of the youngest males were significantly higher in all the nutrients studied, except for vitamin A and vitamin C, than those of counterparts. However, there were not much significant differences in most nutrients for both genders after age 65. Interestingly, nutrient intakes of females were significantly much higher in vitamin A and vitamin C than those of males in all the age groups. It might be elucidated that female subjects consumed more vegetable and fruits than males, which contribute to higher intake of vitamin A and vitamin C.

Ratios of carbohydrate, protein and fat in energy by gender and age are shown in Fig. 1. The younger subjects consumed more fat and less carbohydrate than older subjects. This tendency was clearly demonstrated in both males and females. Overall energy ratio of carbohydrate : protein : fat was 56.2 : 16.8 : 27.0. Generally, subjects in the study consumed more carbohydrate and less fat when compared to the dietary guideline level in USA (19). However, this level was lower in carbohydrate and higher in fat, when compared to the recommended level as an ideal ratio of energy contributing nutrients for Koreans (20).

Table 5 presents dietary sources of food. Expectedly, females consumed more plant food than animal one as their dietary source, compared to males. Of adults aged 18~29, this trend was more pronounced significantly in protein intakes. It is evident that there are gender differences in food preference and consumption. Attention should be given to include animal food which can enhance Fe and Ca absorption for females in the present study. Different approach to nutrition education in both genders might be considered.

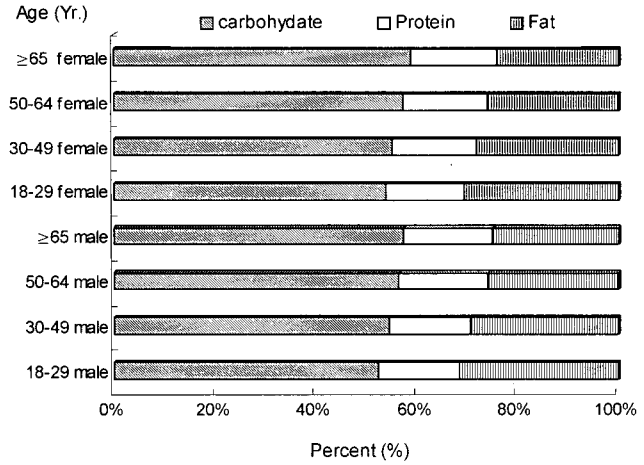

Fig. 1. Ratio of carbohydrate, protein and fat in energy by gender and age.

Korean Americans living in western parts of USA eat sufficient or even excess amounts of nutrients, except for Ca when compared with RDA (Table 4). An average Ca intake of participants was below 75% of RDA, except for the youngest male and 30~49 years male and female. Furthermore, after age 50 in both genders, Ca intake was below 70% with the lowest intake among the oldest male. These results were in agreement with those from Nutrition Survey for Koreans (2). Currently Ca intake is below RDA in all the age groups in Korea (21-23).

These marginal levels of dietary Ca in the study is a public health concern. Adequate Ca is needed to maintain bone density, which delays osteoporosis and decreases risk of bone fractures (24). Effective nutrition education program targeting Korean Americans in the

Table 5. Dietary source of food by gender and age

		Age (yr)	Gender		F
			Male	Female	
Protein (%)	Plant source	18~29	44.9±8.8[1)a2)]	55.8±10.9^{bc}	6.567***
		30~49	52.6±9.2^{ab}	56.4±8.4^{b}	
		50~64	54.2±12.8^{ab}	59.1±9.8^{bc}	
		≥65	58.6±11.8^{bc}	62.8±9.0^{c}	
	Animal source	18~29	55.1±8.8^{a}	44.2±10.9^{bc}	6.567***
		30~49	47.4±9.2^{ab}	43.6±8.4^{b}	
		50~64	45.8±12.8^{ab}	40.9±9.8^{bc}	
		≥65	41.4±11.8^{bc}	37.2±9.0^{c}	
Fat (%)	Plant source	18~29	45.9±9.2^{ab}	56.5±9.7^{b}	2.399*
		30~49	51.1±10.9^{ab}	53.2±9.9^{ab}	
		50~64	45.0±15.7^{a}	52.6±12.2^{ab}	
		≥65	49.5±11.9^{ab}	53.2±13.1^{ab}	
	Animal source	18~29	54.1±9.2^{ab}	43.5±9.7^{b}	2.399*
		30~49	48.9±10.9^{ab}	46.8±9.9^{ab}	
		50~64	55.0±15.7^{a}	47.4±12.2^{ab}	
		≥65	50.5±11.9^{ab}	46.8±13.1^{ab}	
Calcium (%)	Plant source	18~29	48.7±12.7^{a}	59.9±15.2^{ab}	4.638***
		30~49	61.0±13.4^{ab}	63.5±13.1^{b}	
		50~64	61.2±15.7^{ab}	66.1±11.9^{b}	
		≥65	69.3±14.2^{b}	68.6±14.1^{b}	
	Animal source	18~29	51.3±12.7^{a}	40.1±15.2^{ab}	4.638***
		30~49	39.0±13.4^{ab}	36.5±13.1^{b}	
		50~64	38.8±15.7^{ab}	33.9±11.9^{b}	
		>65	30.7±14.2^{b}	31.4±14.1^{b}	
Iron (%)	Plant source	18~29	64.4±11.3^{a}	77.1±9.7^{bc}	11.580***
		30~49	73.3±8.6^{ac}	78.2±6.6^{bc}	
		50~64	76.7±12.0^{bc}	82.6±6.8^{bd}	
		≥65	79.8±10.9^{bcd}	84.8±6.9^{d}	
	Animal source	18~29	35.6±11.3^{a}	22.9±9.7^{bc}	11.580***
		30~49	26.7±8.6^{ac}	21.8±6.9^{bc}	
		50~64	23.3±12.0^{bc}	17.4±6.8^{bd}	
		≥65	20.2±10.9^{bcd}	15.2±6.9^{d}	

[1)]Mean±SD.
[2)]Different superscripts are significantly different in the same row at *$p<0.05$, ***$p<0.001$ by Duncan's multiple range test.

community should be developed and implemented to increase Ca consumption. Intervention strategies for nutrition improvement including the important function of Ca and food sources such as milk and dairy products might be suggested. Routine consumption of dairy products should be encouraged to the elderly Korean Americans in the community.

ACKNOWLEDGEMEMTS

This paper was supported by overseas research fund, from Chosun University, 2002.

REFERENCES

1. Lee MM. 2001. Immigrant women's health: nutritional assessment and dietary intervention. *Culture and Medicine* 175: 133-137.
2. Ministry of Health and Welfare, Republic of Korea. 1998. National Health and Nutrition Survey.
3. Tripp-Reimer T, Choi E, Kelley LS. 2000. Reaching ethnically diverse audiences. *J Am Diet Asso* 1645-1646.
4. Chosun Daily News (US Edition) issued on April, 18. 2003.
5. Sucher KP, Kittler PG. 1991. Nutrition isn't color blind. *J Am Diet Assoc* 91: 297-299.
6. US Department of Health and Human Services. 1989. National Health and Nutrition Examination Survey.
7. The Korean Nutrition Society. 2002. CAN-Pro 2.0 (Computer Aided Nutritional Analysis Program for Professionals 2.0).
8. USDA Nutrient Data Laboratory. www.nal.usda.gov/fnic/foodcomp.
9. Son JY. 1994. Factors influencing diet and dietary changes of Koreans in TompKins County. *PhD Dissertation.* Cornell University, Itaca, NY.
10. Satia JA, Patterson RE, Taylor VM, Cheney CL, Shiu-Thornton S, Chitnarong K, Kristal AR. 2000. Use of qualitative methods to study diet, acculturation, and health in Chinese-American women. *J Am Diet Assoc* 100: 934-940.
11. Rai S, Ganganaa P, Boweing J. 1999. Dietary habits of Asian Indians in relation to length of residence in the United States. *J Am Diet Assoc* 99: 1106-1108.
12. Satia-Abouta J, Patterson RE, Neuhouser ML. 2002. Dietary acculturation: application to nutrition research and dietetics. *J Am Diet Assoc* 102: 1105-1118.
13. Pan YL, Dixon Z, Himburg S, Huffman F. 1999. Asian students change their eating patterns after living in the United States. *J Am Diet Assoc* 99: 54-57.
14. Story M, Harris LJ. 1989. Food habits and dietary change of Southeast Asian refugee families living in the United States. *J Am Diet Assoc* 89: 800-803.
15. Lee SK, Sobal J, Frongillo EA Jr. 1999. Acculturation and dietary practices among Korean Americans. *J Am Diet Assoc* 99: 1084-1089.
16. Song YJ, Pairk HY, Park HR, Hofstetter R. 2004. Socioeconomic, acculturation and lifestyle factors affecting the dietary patterns of Korean-Americans in California. *Nutr Sci* 7: 158-164.
17. Gordon BH, Kang MS, Cho P, Sucher KP. 2000. Dietary habits and health beliefs of Korean-Americans in the San Francisco Bay Area. *J Am Diet Assoc* 100: 1198-1201.
18. Cross NA, Kim KK, Yu ES, Chen EH, Kim JK. 2002. Assessment of the diet quality of middle-aged and older adult Korean Americans living in Chicago. *J Am Diet Assoc* 102: 552-554.
19. US. Departments of Agriculture and Health and Human Service. 2000. *Nutrition and your health: Dietary guidelines for Americans.* 5th ed. Washington DC. p 232.
20. Korean Nutrition Society. 2000. *Korean dietary allowances* 7th ed.
21. Ro HK, Oh KA. 2003. Gender and age differences in the nutritional status of the low income elderly living in Gwangju. *Korean J Com Nutr* 8: 302-310.
22. Yoon HS, Kim GR. 2002. A study on the health and nutritional status of bus drivers in the Masan area. *Korean J Com Nutr* 7: 316-326.
23. Kim YO. 2001. Food and nutrient consumption patterns of Korean adults by socioeconomic status. *Korean J Com Nutr* 6: 645-656.
24. Brown JE, Isaacs JS. 2002. *Nutrition through the life cycle.* Wadsworth Group, Belmont, CA, USA.

(Received April 13, 2005; Accepted May 30, 2005)