

Acculturation and dietary habits of Korean Americans

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This is the first study to investigate how food and nutrient intakes vary with the levels of acculturation of Korean Americans using a dietary assessment tool tested for validity and reliability. The respondents were Korean Americans (n 486) resident in the Greater New York metropolitan area, USA. They were divided into two groups according to the total score of acculturation: low- and high-acculturated groups. Using a food-frequency questionnaire and a modified Suinn-Lew Asian self-identity acculturation scale, differences in the frequencies of food items, food groups and nutrient intakes consumed were analysed by level of acculturation. The low-acculturated group tended to consume significantly more rice, mixed rice, soyabean paste chigae (pot stew), saengsun (fish) chigae, kimchi chigae, other fish broiled or baked, eggs, kimchi, spinach, persimmons, and white or brown sugar in coffee or tea. The high-acculturated group demonstrated a statistically greater tendency to consume bread, cereal, spaghetti, ham, green salad, sweetcorn, chocolate, candies and diet soft drinks. The more acculturated an individual, the more significant was the tendency to consume sweets. The more acculturated group had significantly ($P < 0.05$) higher intakes of % energy from total fat, thiamin, vitamin E and folate, while the low-acculturated group consumed greater amounts of Na, niacin and dietary fibre. The information from the present study can be used to describe dietary habits according to various aspects of acculturation, and allows a better understanding of the dynamics of acculturation and dietary habits.

Acculturation: Korean Americans: Diet: Habits

Korean Americans represent one of the fastest growing Asian American groups in the USA; their population has more than doubled during the past decade (US Department of Commerce, 2001). According to a recent census conducted by the Korean Ministry of Foreign Affairs, in December 1999 2 057 546 Koreans lived in the USA (Korean Ministry of Foreign Affairs, 2000). New York and New Jersey have the second and third largest numbers of Korean Americans after California. In spite of this increase in immigration, the cultural context of Korean Americans' nutritional intakes have never been explored. Most of the studies of Korean Americans have focused primarily on food patterns (California Korean Health Education and Information and Referral Center, 1990; Kim *et al.* 1993; Lee, 1998; Lee *et al.* 1999), but there has only been one study specific to nutritional intakes relating to acculturation issues (Chung, 1995). The various effects of acculturation need to be considered to measure the variations in the daily food intakes of Korean Americans properly.

Acculturation is a process of intercultural borrowing, marked by the continuous transmission of traits and elements between diverse peoples, and results in new and blended patterns (Gove *et al.* 1993). Acculturation has

been shown to influence the dietary habits of immigrants by the retention of or changes in the intakes of foods and nutrients (Kaiser *et al.* 2001; Satia *et al.* 2001). Dietary change, within immigrant groups or within groups undergoing acculturation, has become an issue of increasing interest in community nutrition and nutritional anthropology, as more and more populations experience rapid social change (Lands *et al.* 1990). Migrant studies of first and second generation immigrants to the USA show that acculturation to a western lifestyle appears to result in an increase in morbidity and mortality from many degenerative diseases (Parker *et al.* 1998). Diseases resulting from dietary habit change have been hypothesized to be the cause of the increase (Huang *et al.* 1996). Moreover, the increased intake of total energy, fat and sucrose and decreased intake of total and complex carbohydrates, including fibre, have been reported to play a role in the aetiology of the degenerative diseases in migrant population studies (Marmot & Syme, 1976; Reed *et al.* 1982). Epidemiological studies of diet and its relationship to various social aspects of a particular population or culture can contribute to the development of nutrition programmes and services in clinical and home settings. Information from these studies is useful in the implementation of such

programmes and services at federal, state and local levels (Huang *et al.* 1996).

Acculturation has been viewed as an important variable in the planning of social and psychological intervention for Asian Americans. The process of acculturation is considered as neither linear nor uni-dimensional, but as multi-dimensional, involving changes in behaviours, values and attitudes (Leong, 1986). A validated acculturation scale, Suinn-Lew Asian self-identity acculturation scale (SL-ASIA scale), has been applied to both mental and physical health-related studies, and the same scale has been used in psychotherapy and chronic disease screening in migrant population studies (Gurung & Mehta, 2001). However, no research has been undertaken that relates the level of acculturation to dietary habits.

The aim of the present study was to identify the correlations between demographic factors and acculturation and then relate the acculturation to dietary habits in Korean Americans residing the Greater New York metropolitan area. The term acculturation is used here to represent the degree to which Korean Americans identify with and are integrated into the majority culture. In the present study, acculturation refers to the language, media use, friendship, foods, pride and ethnic self-identity. Comparing the dietary characteristics of Korean Americans adhering to traditional dietary habits *v.* those adopting more acculturated eating pattern will help researchers to understand and assess the nutritional intakes of the migrant population better and to identify any influence of acculturation on dietary habits.

Methods

Sample

The participants were randomly recruited from residential telephone and address books available in Korean American communities residing in the Greater New York metropolitan area. The questionnaires, accompanied by two-dimensional food portion sizes, were posted to 752 Korean Americans; 278 (37%) and 113 (15%) participants replied to a first and second posting respectively. In an extensive telephone-administered survey (up to three telephone calls) by closely supervised bilingual (Korean-English) interviewers after a prolonged period of training, and additional 16% of the participants (122 respondents) replied to the questionnaire. All volunteers who participated in this study were of Korean heritage and ≥ 18 years of age. They all agreed to participate in the study by signing a consent form. The study was reviewed and approved by New York University Human Subjects Committee.

Instrument

The questionnaire included demographic items, such as age, gender, household income, occupation, length of residence in the USA and questions concerning the acculturation scale. The acculturation level of Korean Americans was measured using a modification of the SL-ASIA scale, which was adapted from an acculturation rating

scale for Mexican Americans and has been applied to Asian Americans (Gim *et al.* 1990). The original SL-ASIA scale consisted of a twenty-one-item questionnaire covering language, identity, friendship choice, behaviours, generation and geographic history, and attitude. For the present study, six factors believed to be important in determining acculturation were included in a seventeen-item scale. They were language (six questions: spoken at work and/or at home, written, thought, obtained when a child, spoken with friends), media use (three questions: television, radio, media preferred), friendship (four questions: close friends, social gathering preference, friends preferred, offspring's friends), foods (two questions: food preference at home and at a restaurant), pride (one question) and ethnic self-identity (one question). Each question was rated on a scale ranging from very Korean (1) to very American (5). A higher score indicated a higher level of acculturation.

The participants were asked to check if their dietary habits changed after immigration using five scale values from strongly disagree (1) to strongly agree (5). They were then asked to evaluate the types of meals they consumed recently on a scale ranging from very Korean (1) to very American (5).

A food-frequency questionnaire for Korean Americans (KFFQ) was developed by modifying Block's health habits and history questionnaire (Block *et al.* 1993) to reflect foods consumed by Korean Americans. The KFFQ consisted of 118 food items and standardized measures (portion size, weight, or volume) for each food item were included. The KFFQ was then structured into nine food groups, taking into consideration cultural-specific dietary patterns; it was validated by comparing it with 7 d dietary records of food items, portion sizes and nutrients (Kim *et al.* 2002). The previously validated KFFQ was administered to each participant to identify the daily intakes of the 118 food items and nutrients. All written and spoken instruments given to the study participants were provided in both English and Korean. Translations were checked using a translation-back-translation process.

Data collection

Participants were instructed in detail (both in Korean and English) on how to complete the questionnaire. Additional explanation was provided on the estimation of portion sizes of foods and beverages described in the KFFQ, by food models in picture. All the answers were reviewed after collection and participants were immediately asked, by telephone-administered interview, to clarify any ambiguous or incomplete information if needed. All information collected in the present study was kept strictly confidential; each questionnaire was coded for record keeping and used for data analysis only.

Data analyses

After all the data collection process, 513 questionnaires (68%) were completed and among them twenty-seven respondents were excluded for the following reasons: fasting (more than 2 d), illness or unusual nutrient intakes

(extremely high or low values). The final number of participants for data analyses was 486.

Descriptive statistics, such as mean values and standard deviations, and normality testing, were performed on relevant data using the SPSS 10.0 software package (SPSS Inc., 2000). Of demographic variables, age, length of residence in the USA, education and income were divided into three groups. The trichotomized variables and dichotomized demographic variables (gender and place of birth) were tested if there were any significant differences in acculturation scores.

Intercorrelations of hypothesized demographic variables and acculturation were obtained. The data for total acculturation scores, age, length of residence and education were used as continuous variables, while other variables, such as gender, place of birth, and household annual income were as categorical. In addition, intercorrelations between acculturation (six factors) and changes in dietary habit and type of meals were identified.

The reliability of the acculturation scale was presented as coefficients of internal consistency (Cronbach α). Acculturation categories are usually adjusted to best reflect the study population. For example, while Suinn *et al.* (1995) divided their study subjects into low, medium and high levels of acculturation based on total scores, Gim *et al.* (1990) cross-tabulated acculturation levels by gender and ethnicity: finding that there were no low-accultured Japanese American men, low and medium scores were collapsed to create one category, low-medium and high, forming two groups instead of the three that Suinn *et al.* (1995) used. The results of the present study showed that most people had low acculturation scores, unlike those in the study of Gim *et al.* (1990). Therefore, in the present study we categorized acculturation as low or high.

DietSys[®] (National Cancer Institute, Bethesda, MD, USA), a computer software program, was modified to analyse the nutrient intake from the KFFQ (Block *et al.* 1993). Nutrient compositions of Korean ethnic foods were obtained from the recommended daily allowances for Koreans (Korean Nutrition Association, 2000) and incorporated into the DietSys[®] program. The data editing procedures (range, logical consistency and missing data) were applied using the modified DietSys[®].

For the purposes of analysis, we determined the mean frequency of consumption per d per person of each food item (total of 118 food items) in the KFFQ. Values were assigned to the nine codes of frequency of consumption, taking into consideration each item's contribution to daily consumption. Never or less than once per month was coded as 0; once per month as 0.03 (1/30); twice or three times per month as 0.08 (2.5/30); once per week as 0.14 (1/7); twice per week as 0.29 (2/7); three or four times per week as 0.5 (3.5/7); five or six times per week as 0.79 (5.5/7); once per day as 1.00; twice or more per d as 2.00. The consumption frequencies of the nine food groups were computed after all the frequencies of food items were combined in each food group. The variables used for the analyses were the mean daily frequencies of the nine food groups, and macro- and micronutrient daily intakes (total energy, protein, total fat, carbohydrate, Ca, P, Fe, Na, K, vitamin A, thiamin, riboflavin, vitamin C,

vitamin E, pyridoxine, niacin, cholesterol, dietary fibre, folate and Zn) from the KFFQ. ANOVA and general linear model were used to determine if there were any significant differences in the mean values of the low- and high-acculturation groups after controlling for the six demographic variables (Tabachnick & Fidell, 2000).

Results

Demographic information

Table 1 describes the profile of the participants. The majority were female (64%), middle-aged (37 years old) and from middle-income households (52% had incomes ranging from \$25 000 to \$75 000 per year). Most were born in South Korea (85%) and were married (69%). The average length of residence and education were 9.9 and 14.5 years respectively and the average BMI was 22.1 kg/m². Most respondents reported that they did not

Table 1. Profile of the respondents (*n* 486)*

	<i>n</i>	%
Gender		
Male	174	35.8
Female	312	64.2
Place of birth		
Korea	411	84.6
USA	75	15.4
Household annual income		
< \$10 000	45	9.3
\$10 000–\$14 999	24	4.9
\$15 000–\$24 999	60	12.3
\$25 000–\$34 999	66	13.6
\$35 000–\$49 999	90	18.5
\$50 000–\$74 999	96	19.8
\$75 000–\$99 999	39	8.0
≥ \$100 000	66	13.6
Marital status		
Single	129	26.5
Married	333	68.5
Other (widowed, divorced, separated)	24	4.9
Smoker		
Yes	78	16.0
No	408	84.0
Exercise		
Yes	144	29.6
No	342	70.4
Vitamin and/or mineral supplements		
Yes, fairly regularly	84	17.3
Yes, but not regularly	141	29.0
No	261	53.7
Change in dietary habits after immigration		
Strongly disagree	51	10.5
Disagree	84	17.3
Don't know	27	5.6
Agree	216	44.4
Strongly agree	33	6.8
Not available	75	15.4
Age (years)†	36.9	11.9
Length of residence in the USA (years)†	9.9	7.2
Education (years)†	14.5	3.4
Height (m)†	1.636	0.077
Weight (kg)†	59.4	11.7
BMI (kg/m ²)†	22.1	3.1
Acculturation†	2.1	0.8

* For details of recruitment procedures, see p. 470.

† Mean value and standard deviation.

smoke (84%), did not exercise (70%) and did not take vitamin and/or mineral supplements (54%). Over one-half (51%) answered that their dietary habits had changed since they had immigrated to the USA.

The mean score of acculturation was a low 2.1 (on a scale of 1 to 5). Most Korean Americans in the present study had a low level of acculturation in all seventeen items (Table 2). Most reported using the Korean language predominantly, whether at home (>90%), with friends (80%), thinking (81%) or when reading (63%). Almost one-half (48%) even reported that they spoke mainly Korean at work. Almost all respondents (92%) had spoken Korean as a child. The majority of respondents (87%) reported that they preferred to socialize with other Koreans and that they preferred Korean food (82% when eating at home and 63% when eating out). Over two-thirds proudly identified themselves as Korean. However, 77% of

the respondents said they wanted their child(ren)'s friends to be equally Korean-American or more American, and that they preferred to listen to media programmes in equally Korean-English or more in English (63%).

Demographics and acculturation

Table 3 shows acculturation scores by demographic variables. Age, place of birth, length of residence in the USA, and education were related to the mean values of acculturation scores. Those who reported higher levels of acculturation to the USA were younger, were born in USA, had stayed longer in the USA and were more highly educated. As presented in Table 4, younger individuals born in the USA, had lived longer in the USA, and were more educated, tended to have a higher level of acculturation.

Table 2. Distribution of acculturation by the respondents to the Korean American food-frequency questionnaire (n 486)*

Code... Item	1		2		3		4		5		Mean	SD
	n	%	n	%	n	%	n	%	n	%		
What language(s) do you speak at work?†	60	12.3	174	35.8	93	19.1	78	16.0	81	16.7	2.9	1.3
What language(s) do you speak at home?†	321	66.0	114	23.5	21	4.3	18	3.7	12	2.5	1.5	0.9
In general, what language(s) do you read?†	201	41.4	105	21.6	72	14.8	66	13.6	42	8.6	2.3	1.4
In what language(s) do you usually think?†	291	59.9	102	21.0	39	8.0	24	4.9	30	6.2	0.8	1.2
What language(s) did you use as a child?†	429	88.3	18	3.7	18	3.7	18	3.7	3	0.6	1.3	0.8
What language(s) do you usually speak with your friends?†	315	64.8	75	15.4	39	8.0	30	6.2	27	5.6	1.7	1.2
In what language(s) are the television programmes that you usually watch?†	84	17.3	84	17.3	111	22.8	117	24.1	90	18.5	3.1	1.4
In what language(s) are the radio programmes that you usually listen to?†	141	29.0	72	14.8	84	17.3	60	12.3	129	26.6	3.0	1.6
In general, in what language(s) are the films, television and radio programmes you prefer to watch and listen to?†	111	22.8	69	14.2	120	24.7	114	23.5	72	14.8	2.9	1.4
Your close friends are:†	333	68.5	90	18.5	42	8.6	9	1.9	12	2.5	1.5	0.9
You prefer going to social gatherings and parties at which people are:†	288	59.3	135	27.8	45	9.3	12	2.5	6	1.2	1.6	0.9
The persons you visit or visit you are:†	324	66.7	117	24.1	21	4.3	9	1.9	15	3.1	1.5	0.9
If you could choose your child(ren)'s friends, you would want them to be?†	57	11.7	54	11.1	330	67.9	33	6.8	12	2.5	2.8	0.8
What do you usually eat at home?†	219	45.1	180	37.0	57	11.7	21	4.3	9	1.9	1.8	0.9
What is/are your favourite restaurant(s)?†	153	31.5	153	31.5	123	25.3	42	8.6	15	3.1	2.2	1.1
If you consider yourself a member of Korean group, how much pride do you have in this group?‡	171	35.2	156	32.1	33	6.8	123	25.3	3	0.6	2.2	1.2
Among the following terms which best represents you?†	207	42.6	156	32.1	99	20.4	15	3.1	9	1.9	1.9	1.0

* For details of subjects, recruitment and procedures, see Table 1 and p. 470.

† Coded: 1, very (extremely) Korean; 2, more Korean; 3, both equally; 4, more American; 5, very (extremely) American.

‡ Coded: 1, extremely proud; 2, moderately proud; 3, little pride; 4, no pride but do not feel negative toward Korean group; 5, no pride and do feel negative toward Korean group.

Table 3. Acculturation scores by demographic variables*

Variables	<i>n</i>	%	Mean	SD	<i>F</i>	Statistical significance of effect: <i>P</i> <
Age (years)					31.48	0.001
19–30	133	27.4	2.7	0.9		
31–59	293	60.3	2.0	0.5		
> 60	60	12.3	1.4	0.3		
Gender					2.23	NS
Male	174	35.8	2.2	0.8		
Female	312	64.2	2.0	0.7		
Place of birth					63.41	0.001
Korea	411	84.6	2.0	0.6		
USA	75	15.4	3.7	0.5		
Length of residence in the USA (years)					15.80	0.001
≤ 10	284	58.4	1.9	0.5		
11–20	163	33.5	2.3	0.9		
> 20	39	8.0	3.0	1.0		
Education (years)					15.83	0.001
≤ 12	109	22.4	1.6	0.6		
13–16	344	70.8	2.2	0.7		
> 16	33	6.8	2.6	0.6		
Household annual income					2.81	NS
< \$25 000	129	26.5	2.1	0.9		
\$25 000–\$74 999	252	51.9	2.0	0.6		
> \$75 000	105	21.6	2.4	0.9		

* For details of subjects, recruitment and procedures, see Table and p. 470.

Acculturation, changes in dietary habit and type of meals

Table 5 shows the correlation between acculturation and changes in dietary habits and types of meals. Changes in dietary habit were correlated positively with language, media use, friendship, food and ethnic self-identity. The types of meals consumed were also positively correlated with the same variable. Those who used the English language and the American mass media had more American friends, ate American food, had an American ethnic self-identity, tended to change dietary habits after immigration and ate American-style meals.

Acculturation and the frequency of consumption of food items and food groups

Reliability of the modified SL-ASIA scale was high, as demonstrated by a Cronbach α 0.92. Respondents were divided into two groups, i.e. low- and high-acculturation groups, to determine whether there were any significant differences in frequencies of consumption of food items,

food groups and in nutrient intakes according to the level of acculturation. Table 6 shows the mean frequencies of all 118 food items and of the nine food groups as estimated by the KFFQ and the result of ANOVA performed upon between the two acculturation groups. Significant differences were found in the consumption frequencies of twenty-one food items out of 118. These were: rice, bread, mixed rice and cereal in food group 1 (grain, starch and cereal); spaghetti, lasagne or other pasta with tomato sauce, soyabean paste chigae, saengsun chigae, kimchi chigae and pizza in food group 2 (mixed dishes); ham and lunch meats, other fish grilled or baked, and eggs in food group 3 (meat, fish, poultry and eggs); kimchi, spinach, sweetcorn and green salad in food group 4 (vegetables); persimmons in food group 5 (fruits and juices); sweets and chocolate in food group 6 (sweets); diet soft drinks and white or brown sugar in coffee or tea in food group 9 (beverages). Among the twenty-one statistically significant food items, the low-acculturated group tended to consume significantly more rice, mixed

Table 4. Correlation of demographic variables with acculturation (*n* 486)†
(Correlation coefficients)

	Acculturation
Age	–0.556**
Gender	–0.117
Place of birth	0.501**
Length of residence in the USA	0.378**
Education	0.417**
Income	0.057

** *P*<0.01 (two-tailed).

† For details of subjects, recruitment and procedures, see Table 1 and p. 470.

Table 5. Correlation of acculturation (six factors) with change in dietary habit and type of meals (*n* 486)†
(Correlation coefficients)

	Change in dietary habit	Breakfast	Lunch	Dinner
Language	0.430**	0.394**	0.532**	0.659**
Media use	0.363**	0.363**	0.453**	0.468**
Friendship	0.303**	0.374**	0.356**	0.472**
Food	0.215**	0.475**	0.452**	0.519**
Pride	–0.039	0.091	–0.043	0.039
Ethnic self-identity	0.344**	0.363**	0.397**	0.533**

** *P*<0.01 (two-tailed).

† For details of subjects, recruitment and procedures, see p. 470.

Table 6. Frequencies of food items and food groups of two acculturation groups of Korean Americans (*n* 486) estimated by the Korean American food-frequency questionnaire†‡
(Mean values and standard deviations)

Food item	Low acculturation (<i>n</i> 246)		High acculturation (<i>n</i> 240)		<i>F</i>	Statistical significance of effect: <i>P</i> <
	Mean	SD	Mean	SD		
Food group 1 (grain, starch and cereal)	3.04	1.06	2.84	1.25	1.444	NS
Rice***	1.48	0.70	1.05	0.63	5.004	0.001
Mixed rice*	0.64	0.71	0.42	0.48	2.218	0.05
Porridge	0.02	0.08	0.03	0.10	1.323	NS
Bread**	0.33	0.37	0.53	0.45	2.913	0.01
Bagels	0.23	0.30	0.29	0.30	2.498	NS
Muffins, biscuits	0.12	0.22	0.17	0.22	1.586	NS
Waffles, pancakes	0.06	0.10	0.07	0.11	0.691	NS
Cereal*	0.14	0.25	0.25	0.43	2.437	0.05
Cooked cereal	0.02	0.09	0.03	0.08	0.932	NS
Food group 2 (mixed dishes)	1.72	1.11	1.52	0.76	0.792	NS
Noodles, udon	0.32	0.31	0.27	0.23	0.637	NS
Mandu	0.11	0.23	0.12	0.16	1.044	NS
Bibimbap	0.12	0.25	0.10	0.15	0.774	NS
Fried rice	0.08	0.11	0.08	0.08	1.095	NS
Curried rice, hirice	0.04	0.05	0.05	0.05	1.399	NS
Kimbab	0.07	0.08	0.06	0.05	1.394	NS
Sullnongtang, komtang, kalbitang,	0.10	0.16	0.06	0.07	1.553	NS
Soyabean paste chigae**	0.28	0.21	0.18	0.19	3.861	0.01
Stewed chicken	0.04	0.09	0.03	0.05	0.857	NS
Yukgejang	0.08	0.17	0.04	0.06	2.074	NS
Saengsun chigae**	0.10	0.09	0.06	0.07	2.908	0.01
Kimchi chigae*	0.19	0.16	0.14	0.12	3.048	0.05
Chapchae	0.04	0.05	0.04	0.04	0.740	NS
Pindaedduk, pajeon	0.05	0.07	0.04	0.05	0.230	NS
Spaghetti, lasagne, other pasta with tomato sauce***	0.04	0.09	0.12	0.14	9.690	0.001
Pizza*	0.07	0.09	0.11	0.12	3.054	0.05
Food group 3 (meat, fish, poultry and eggs)	2.06	1.26	1.90	1.06	1.086	NS
Bulgogi, kalbi	0.18	0.24	0.15	0.17	1.221	NS
Beef steak	0.12	0.16	0.09	0.09	0.633	NS
Pork steak	0.10	0.23	0.06	0.08	0.456	NS
Jangjorim	0.05	0.09	0.04	0.07	0.859	NS
Fried chicken	0.07	0.15	0.09	0.11	2.058	NS
Roasted turkey	0.10	0.03	0.07	0.04	1.989	NS
Hamburgers, cheeseburgers	0.11	0.12	0.15	0.19	1.511	NS
Ham, lunch meats**	0.07	0.09	0.14	0.20	3.324	0.01
Sausage	0.07	0.14	0.07	0.10	1.864	NS
Bacon	0.04	0.09	0.04	0.08	0.598	NS
Fried fish	0.08	0.11	0.06	0.10	0.927	NS
Sashimi, sushi	0.08	0.10	0.07	0.10	0.141	NS
Shellfish	0.07	0.09	0.07	0.10	0.497	NS
Other fish*	0.16	0.19	0.11	0.12	2.275	0.05
Dried anchovies, dried squid	0.14	0.16	0.17	0.25	1.173	NS
Saengsunmuk	0.08	0.11	0.09	0.11	0.416	NS
Jutgal	0.11	0.18	0.07	0.17	1.461	NS
Eggs*	0.54	0.35	0.42	0.35	2.508	0.05
Food group 4 (vegetables)	5.93	3.31	5.23	2.88	0.568	NS
Kimchi, kakkugi***	1.55	0.59	0.98	0.62	5.543	0.001
Bean sprouts, mungbean sprouts	0.35	0.32	0.30	0.33	1.751	NS
Spinach, leek**	0.26	0.25	0.17	0.17	3.854	0.01
Lettuce (romaine)	0.43	0.49	0.34	0.31	2.073	NS
Cabbage	0.15	0.20	0.17	0.28	0.390	NS
Broccoli	0.14	0.20	0.12	0.15	2.080	NS
White radish	0.14	0.29	0.10	0.16	1.083	NS
Doraji	0.05	0.09	0.04	0.07	0.217	NS
Kaetnip muchim	0.10	0.17	0.07	0.10	0.795	NS
Muk	0.05	0.07	0.04	0.08	2.058	NS
Green salad*	0.16	0.24	0.26	0.31	2.197	0.05
Cauliflower	0.03	0.08	0.04	0.11	0.762	NS
Carrot	0.33	0.39	0.35	0.39	0.663	NS
Cucumber	0.37	0.38	0.37	0.37	0.912	NS
Courgette	0.30	0.34	0.26	0.31	1.072	NS
Tomatoes, tomato juice	0.24	0.35	0.24	0.28	1.689	NS
French fries, fried potatoes	0.13	0.17	0.18	0.18	1.207	NS
Potatoes and sweet potatoes	0.08	0.13	0.10	0.13	1.511	NS

Table 6. Continued

Food item	Low acculturation (n 246)		High acculturation (n 240)		F	Statistical significance of effect: P<
	Mean	SD	Mean	SD		
Sweetcorn**	0.06	0.12	0.12	0.15	3.744	0.01
Kongjaban	0.05	0.13	0.07	0.13	1.540	NS
Tofu	0.37	0.24	0.35	0.32	1.311	NS
Mushrooms	0.23	0.28	0.27	0.26	0.923	NS
Miyuk	0.18	0.16	0.14	0.16	1.209	NS
Other seaweed	0.18	0.29	0.14	0.24	1.113	NS
Food group 5 (fruits and juices)	2.85	2.34	3.41	6.66	1.284	NS
Apples, pears	0.45	0.42	0.37	0.41	0.882	NS
Bananas	0.23	0.33	0.21	0.22	1.253	NS
Peaches apricots (canned)	0.11	0.20	0.13	0.28	0.344	NS
Peaches, apricots (fresh)	0.20	0.30	0.17	0.29	0.569	NS
Persimmons*	0.06	0.10	0.03	0.07	2.958	0.05
Grapes	0.13	0.15	0.15	0.18	0.663	NS
Pineapples	0.05	0.11	0.04	0.05	0.537	NS
Cantaloupe	0.14	0.20	0.11	0.39	0.653	NS
Watermelon	0.34	0.38	0.23	0.30	1.616	NS
Strawberries	0.18	0.23	0.16	0.17	1.094	NS
Oranges, tangerines, grapefruits	0.27	0.29	0.30	0.31	1.580	NS
Apple juice	0.16	0.24	0.15	0.24	1.047	NS
Orange juice, grapefruit juice	0.44	0.50	0.54	0.44	1.593	NS
Nuts	0.10	0.21	0.81	6.48	1.321	NS
Food group 6 (sweets)**	0.69	0.69	1.05	0.95	3.443	0.01
Rice cakes	0.08	0.13	0.06	0.08	0.954	NS
Kangjung	0.09	0.02	0.02	0.06	2.195	NS
Ice cream	0.12	0.17	0.18	0.21	1.447	NS
Frozen yogurt	0.07	0.13	0.09	0.15	0.805	NS
Doughnuts, cookies, cakes, pastry	0.14	0.21	0.20	0.23	2.358	NS
Chocolate*	0.09	0.18	0.15	0.21	2.566	0.05
Candies**	0.09	0.18	0.22	0.39	3.560	0.01
Jelly, jam	0.09	0.17	0.14	0.24	1.240	NS
Food group 7 (dairy products)	1.08	1.22	1.06	1.08	1.133	NS
Whole milk	0.44	0.58	0.30	0.43	1.064	NS
Skimmed and semi-skimmed milk	0.19	0.41	0.26	0.47	1.418	NS
Plain yogurt	0.12	0.25	0.09	0.19	0.619	NS
Low-fat yogurt	0.06	0.18	0.07	0.19	1.008	NS
Cheese	0.13	0.21	0.20	0.31	2.358	NS
Cream cheese	0.14	0.26	0.14	0.21	2.457	NS
Food group 8 (spreads, dressing, oils, fats)	1.01	1.12	1.18	0.96	1.153	NS
Peanut butter	0.10	0.34	0.08	0.16	2.089	NS
Butter	0.16	0.25	0.21	0.31	1.132	NS
Margarine	0.10	0.22	0.16	0.28	1.485	NS
Ketchup	0.21	0.27	0.29	0.28	2.194	NS
Mayonnaise	0.22	0.29	0.20	0.24	1.418	NS
Salad dressing	0.21	0.30	0.24	0.27	1.367	NS
Food group 9 (beverages)	4.38	2.84	3.92	2.60	1.467	NS
Regular soft drinks	0.39	0.48	0.42	0.47	1.717	NS
Diet soft drinks*	0.06	0.19	0.18	0.40	2.469	0.05
Beer	0.06	0.14	0.10	0.20	0.969	NS
Soju, chungju	0.02	0.07	0.02	0.08	0.710	NS
Wine	0.03	0.06	0.04	0.10	2.357	NS
Spirits	0.03	0.14	0.03	0.10	2.135	NS
Coffee (caffeinated)	1.05	0.73	0.90	0.78	1.682	NS
Coffee (decaffeinated)	0.21	0.46	0.16	0.42	0.781	NS
Tea	0.09	0.20	0.16	0.37	0.709	NS
Non-dairy creamer	0.59	0.67	0.45	0.68	0.896	NS
Milk in coffee or tea	0.41	0.63	0.44	0.62	0.649	NS
White or brown sugar in coffee or tea*	0.76	0.74	0.53	0.73	2.496	0.05
Artificial sweetener in coffee or tea	0.10	0.36	0.05	0.17	0.556	NS
Ginseng	0.03	0.08	0.03	0.08	1.537	NS
Honey, sugar in ginseng tea	0.05	0.15	0.05	0.23	0.709	NS
Sikhe	0.04	0.06	0.03	0.04	1.583	NS
Barley water	0.47	0.74	0.33	0.65	0.997	NS

*P<0.05, **P<0.01, ***P<0.001 (ANOVA and general linear model after controlling for age, gender, length of residence in the USA, education, income and place of birth).

† For details of subjects, recruitment and procedures, see Table 1 and p. 470.

‡ Values are given as frequency per d per person; 0.00, never or less than once per month; 0.03, once per month; 0.08, two or three times per month; 0.14, once per week; 0.29, twice per week; 0.50, three or four times per week; 0.79, five or six times per week; 1.00, once per d; 2.00, more than twice per d.

rice, soyabean paste chigae, saengsun chigae, kimchi chigae, other fish grilled or baked, eggs, kimchi, spinach, persimmons, and white or brown sugar in coffee or tea. The high-acculturation group demonstrated a statistically significant tendency to consume more bread, cereal, spaghetti (lasagne, other pasta with tomato sauce), pizza, ham and lunch meats), green salad, sweetcorn, chocolate, candies and diet soft drinks.

The consumption frequencies of the nine food groups were computed after all the frequencies of the food items had been combined. In food group 6 (sweets), both chocolate and sweets were found to be related to acculturation, indicating that the more acculturated an individual is, the greater the likelihood that s/he consumes both of these food items.

Acculturation and nutrient intakes

The low- and high-acculturation groups were compared to determine if there were any statistically significant differences in nutrient intakes estimated by the KFFQ using ANOVA (Table 7). The nutrients found to be statistically significant were: % energy from total fat, Na, dietary fibre, folate, vitamin E, thiamin and niacin. The higher the acculturation, the more the % energy from total fat, thiamin, vitamin E, and folate consumption, and the lower the acculturation, the greater Na, niacin and dietary fibre intakes, and these differences were statistically significant.

Discussion

Acculturation studies have been incorporated into several studies upon minority food habits, and they have

demonstrated the nature of relationships between food habits and availability, racial differences and length of residence (Lewis & Glaspy, 1975; Newman, 1980). Relatively few studies have reported upon the relationship between nutrient intakes and levels of acculturation; rather, most studies have been performed to describe differences in food intake patterns due to migration.

According to Grivetti & Paquette (1978), dietary changes occur among Chinese Americans due to acculturation. In another Chinese immigrant food habit study, a statistically significant change in food habits practiced before and after immigration to the USA was identified (Newman, 1980). However, people residing in the USA for >5 years showed a significant reversal in some food habits back to traditional Chinese food habits. In that study of Chinese immigrants, 61% of the respondents reported that their dietary habits had changed after immigration. However, owing to the design of the study, it is not possible to ascertain whether or not there was a reversal in some food habits after a longer period of residence in the USA. The correlation between length of residence in the USA and dietary habit changes was 0.31, indicating that the longer individuals resided in the USA, the more likely they are to alter their dietary habits.

Similar findings were obtained by dietary studies on Korean American, studies that found that the intakes of meat, fruits, milk and fat increased after immigration (California Korean Health Education and Information and Referral Center, 1990; Chung, 1995). As the duration of residence in the USA increased, the consumption of American foods also increased (California Korean Health Education and Information and Referral Center, 1990).

Table 7. Daily nutrient intakes of two acculturation groups of Korean Americans (*n* 486) estimated by the Korean American food-frequency questionnaire† (Mean values and standard deviations)

Nutrients	Low acculturation <i>n</i> 246		High acculturation <i>n</i> 240		<i>F</i>	Statistical significance of effect: <i>P</i> <
	Mean	SD	Mean	SD		
Energy (kJ)	7841	1720.5	7766	1667.8	2.054	NS
% Energy from protein	16.4	2.86	16.2	3.17	1.490	NS
% Energy from total fat*	24.3	2.57	26.9	3.95	6.375	0.05
% Energy from carbohydrate	58.9	7.19	56.4	9.37	0.937	NS
Protein (g)	76.7	31.3	74.9	23.6	1.668	NS
Total fat (g)	50.5	15.0	55.5	25.0	1.524	NS
Carbohydrate (g)	275.8	24.5	261.7	57.0	0.798	NS
Ca (mg)	709.8	110.9	702.0	120.0	1.867	NS
P (mg)	943.5	258.5	926.6	293.5	1.954	NS
Fe (mg)	12.7	3.97	13.2	4.18	2.346	NS
Na** (mg)	3034	807.3	2339	705.3	10.065	0.01
K (mg)	1784	268.7	1733	318.5	1.424	NS
Vitamin A (RE)	868.30	311.8	967.0	354.9	1.157	NS
Thiamin (mg)*	1.35	0.39	1.60	0.48	6.267	0.05
Riboflavin (mg)	1.67	0.57	1.42	0.69	1.360	NS
Vitamin C (mg)	128.3	44.3	124.6	49.4	0.967	NS
Vitamin E** (mg)	9.90	4.17	12.1	3.86	9.426	0.01
Pyridoxine (mg)	1.93	0.69	2.03	0.77	1.850	NS
Niacin (mg)*	20.3	6.09	18.7	4.08	3.468	0.05
Cholesterol (mg)	193.8	88.2	185.5	100.2	0.790	NS
Fibre (g)**	11.4	3.98	8.87	3.10	8.894	0.01
Folate (µg)**	294.3	115.6	360.8	138.8	9.031	0.01
Zn (mg)	9.92	3.50	10.9	7.86	0.682	NS

P*<0.05, *P*<0.01 (ANOVA and general linear model after controlling for age, gender, length of residence in the USA, education, income and place of birth).

† For details of subjects, recruitment and procedures, see Table 1 and p. 470.

Chung (1995) also reported that the higher the acculturation level, the less frequently respondents consumed traditional Korean foods.

In the present study, among the nine food groups the frequency of consumption of food group 6 (sweets), in particular, was found to be significantly related ($P < 0.01$) to the level of acculturation. The more acculturated, the higher the tendency to consume food items in the sweets food group. Bertino & Chan (1986) found that there were differences in sweet and sugar consumption between Chinese (representative of low acculturated recent immigrants) and Americans of European decent (representative of high-acculturated groups), which concurs with the result of the present study.

Researchers have previously examined the relationship between alcohol consumption and the level of acculturation. In several available studies about Latino Americans' dietary practices, acculturation was found to be positively related to both frequency and total amount of alcohol consumed (Black & Markides, 1993; Otero-Sabogal *et al.* 1995). An additional study supported the finding that problems associated with alcohol were more frequent and widespread when the Samoan communities were acculturated into the USA mainstream (Hanna & Fitzgerald, 1993). However, no significant difference in alcohol consumption was found between the two acculturation groups in the present study.

While there is a significant difference ($P < 0.05$) in % energy from total fat between the low- and high-acculturation groups, the values for % energy from total fats in both groups are much lower than in the general US population. A recent study on Korean women in New Haven, CT, USA, observed a similar nutrient consumption pattern with acculturation (Chung, 1995). Korean immigrants are likely to assimilate at a slower rate and tend to maintain cultural traditions, especially dietary habits, than other Asian ethnic groups (Kim *et al.* 1993).

In an ethnic comparative study, there were no significant differences in the intakes of energy and Na between a recent Chinese immigrant group and a white group (Bertino & Chan, 1986). However, while K intake and K:energy ratio were greater in the white subjects, Na:energy and Na:K ratios were greater in the Chinese. The Chinese preferred saltier foods more than the white subjects did, which may also be applicable to Korean Americans and account for the higher Na consumption in the low-acculturation group in the present study; they consumed more salty traditional Korean foods, such as kimchi and soyabean paste chigae. In a survey by Netland & Brownstein (1984), who assessed the extent of acculturation and compared the diets of Asian Americans and white subjects, Asian Americans were significantly more likely to have diets that were deficient in vitamin A, riboflavin, Ca and Mg than white subjects. In addition, elderly Asians were found to have higher Na, lower K and lower dietary fat intakes than white subjects.

The intakes of energy, protein, total fat, cholesterol and riboflavin in the present study were similar to those of Chung (1995), and while the intake of Ca was higher in our present study, the intakes of carbohydrate, vitamin

A, thiamin, vitamin C, Fe and niacin were lower. As reported in a study on the nutritional status of elderly Chinese American, Korean American and Japanese American, a large percentage of Korean American elderly were found to consume deficient amounts of protein and vitamins A and C (Kim *et al.* 1993).

Lewis & Glaspy (1975) found that when Filipino women migrate to the USA, ethnic food habits are modified, but not abandoned, and that changes are likely to be for the better nutritionally. However, according to Guendelman & Abrams (1995), first-generation Mexican American women, who are assumed to have a low acculturation level, had higher average intakes of protein, vitamins A and C, folic acid and Ca than second-generation Mexican American and white non-Hispanic women.

In the present study, demographic variables, age, place of birth, length of residence in the USA, and education were found to be correlated with acculturation to an US lifestyle after immigration. A similar study, conducted among Koreans in New York, New Jersey and Hawaii found that the acculturation index was related to age, income, education, occupation, gender, and living with or without other family members (spouse or school-aged children) (Lee, 1998). In a Connecticut (USA)-based study, Chung (1995) found that acculturation was significantly related to length of residence in the USA, age, education and occupation. In particular, the most important variable was proficiency in English, which concurs with another study (Lee *et al.* 1999). In several studies in other minority populations, fluency in English was found to be strongly associated with numerous measures of social adjustment in the USA (Wetermeyer & Cheng, 1996; Flores, 2000). In a further study of Vietnamese women in the USA using the SL-ASIA scale as an acculturation index, language acculturation was strongly related to attitudes and habits to health practices, such as regular examinations (Yi, 1998).

Although our present results show an overall low level of acculturation, it was possible to categorize respondents into a lower and a slightly higher grouping using a highly reliable acculturation scale and then to compare dietary habits between the two acculturation groups. The present study is the first to consider specific issues regarding nutritional intakes as related to acculturation in the immigrant population using a dietary assessment method tested for its validity and reliability. The information from the present study can be used to describe dietary habits according to the various aspects of acculturation, and allows a better understanding of the dynamics between nutrient intakes and acculturation. It should help researchers to recognize, rather than ignore, specific food consumption patterns *v.* different levels of acculturation among the Korean American population.

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