

## Dietary Patterns and Acculturation of Korean American Adults and Adolescents Living in California\*

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### ABSTRACT

This study was conducted to define dietary patterns among 227 Korean American adults and 151 teenagers living in California using frequency of intake of major food groups and to examine associations of dietary patterns with selected demographic and acculturation variables. Three dietary patterns, "healthful", "Korean", and "western", were identified using factor analysis. For both groups, "healthful" pattern was characterized by high loading on milk/milk products, fruit, fruit juice, and bean/bean products. "Korean" pattern had high loading on rice and kimchi. "Western" pattern was characterized by high loading on meat/meat products, soda, and noodle/pasta. Among Korean American adults, women tended to have higher scores of "healthful" pattern but lower scores of "western" pattern, while there was no association of "Korean" pattern with gender. The older adults were likely to have higher "Korean" pattern score. Length of stay in the US and English levels were negatively associated with "Korean" pattern. Korean American female adolescents had lower "western" pattern scores than did male adolescents. Age was inversely associated with "healthful" pattern in adolescents. The adolescents who had felt more proud of being a Korean descendant had higher scores on "Korean" dietary pattern. The study findings support that dietary patterns are associated with acculturation variables such as length of residence in the US, English fluency, and particularly pride in ethnicity for adolescents. Further studies are needed to understand associations of dietary patterns and acculturation with health risk of ethnic groups. (*J Community Nutrition* 8(3): 147~152, 2006)

**KEY WORDS:** dietary patterns · acculturation · Korean Americans · factor analysis.

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### Introduction

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Dietary patterns might better reflect real food and nutrient intake than any single food item or nutrient because people eat combinations of foods containing a mix of nutrients and non-nutrients (Hu 2002; Kant 2004). Factor and cluster analysis are two commonly used methods to derive dietary patterns empirically from collected dietary data (Newby, Tucker 2004). This approach is considered a sound dietary assessment method to provide suggestions for future research.

Understanding dietary patterns and acculturation of immigrants and their descendents provides useful information

required for nutrition education for them, since dietary patterns usually reflect food cultures of both their homeland and new host country (Kudo 2000; Lv, Cason 2004). Asian immigrants in the United States experience cultural transitions including dietary changes (Lee 2006). How new immigrants retain and modify their traditional eating habits has significant implications for their long-term health as well as for their cultural identity (Satia-Abouta et al. 2002). Among Asian American groups, Korean Americans are the fifth largest one and has a relatively short immigration history (Lee 2006). Therefore, the majority of older adult Korean Americans are of the first generation. Among family members of Korean Americans, in general, adults are more reluctant to make changes, especially for daily life practices at home, whereas children are more exposed to the host culture than adults because they attend school and associate with different ethnic groups (Story et al. 2002). Therefore, children's diets are considered to be different from adults' in terms of dietary acculturation. There are only limited studies on dietary patterns

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and acculturation factors of Korean Americans (Yang et al. 2005). This study was conducted to define dietary patterns of Korean American adults and teenagers using frequency of intake of major food groups, and to examine associations of dietary patterns with acculturation-related variables.

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## Subjects and Methods

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### 1. Study subjects

Sampling and collecting methods have been described elsewhere (Park et al. 2003; Park et al. 2004). In brief, a cross-sectional survey was conducted with a convenience sample of Korean Americans living in California who had lived in the US over two years. The subjects were 167 women aged 30 to 76 years, 60 men aged 39 to 56 years, and 151 adolescents aged 13 to 19 years. Korean Americans were recruited through the Korean Health Center in Los Angeles and Korean churches in southern and northern California. Participants were also recruited through Korean newspapers and broadcasting services in these areas.

### 2. Data collection

Information on food intake frequency and immigration was collected in 1999 and 2000. A brief questionnaire was developed to obtain information on their demographic information, acculturation status, eating practices, and intake frequency of 16 food groups.

All aspects of the survey were pilot tested with small groups of Korean Americans for applicability and clarity of the questions. The San Diego State University's Committee on the Protection of Human Subjects approved the study. Both English and Korean versions of the questionnaires were developed and approved. All interviewers were trained in the survey protocol and could administer all portions of the survey in English and Korean. The questionnaire was self-administered under the instruction of the interviewers.

### 3. Statistical analyses

Statistical analyses were conducted using SAS Version 8.01. Means and percentages for demographic, acculturation, and dietary characteristics for subjects were calculated and presented. The differences in mean frequencies of selected food group intake between adults and adolescents were tested using t-test. To define dietary patterns with frequency of intake for 16 food groups, 'yellow vegetables' and 'other vegetables' were combined to 'vegetables', 'citrus fruits' and 'other fruits'

were combined to 'fruits', and water was omitted to make 13 food groups (Table 2). Factor analysis using principal component method and varimax rotation was performed with weekly frequencies of eating the 13 food groups. Three distinct factors were identified based on the eigenvalue > 1.25 criterion, a scree plot, and the interpretability (Hatcher 1994) and named as "healthful", "Korean", and "western" patterns. Factor scores for each subject were calculated for three factors and used to study associations with acculturation.

Multiple linear regression analysis was conducted using the factor scores generated for each individual for each pattern as dependent variables. Standardized multiple regression coefficients ( $\beta$ ) were presented to assess the relative importance of independent variables (Hatcher, Stepanski 1994). The independent variables included: gender, age, age of arrival in the US, length of stay in the US, ease of communication in English, perceived comparison of life in the US with life in Korea, perceived satisfaction with life in the US, perceived adaptation to the life in the US for adults; gender, age, ease of communication in English, language spoken with parents, self-ethnic identification, and pride of being a Korean descendant for adolescents.

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## Results and Discussion

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### 1. General characteristics of subjects

Table 1 shows the demographic and acculturation characteristics of Korean American adults and adolescents. The majority of adults were born in Korea and immigrated to the US after growing up. For adults, the mean age of arrival in the US was 30 years and the mean length of residence in the US was 15.4 years. Previous studies about Korean Americans' diets reported wide range of mean length of residence (from 8.1 to 21.4 years) in the US (Cross et al. 2002; Kim, Chan 2004; Kim, Sim 2001; Yang et al. 2001).

Most Korean American adolescents spoke English very fluently. However, many of them used Korean language when they talked with parents. The score for ethnic identity of adolescents was 3.5 in the scales of 1 (completely American) to 5 (completely Korean). This suggests they considered themselves as mixed ethnicity of Korean and American. Nevertheless, they reported that they were proud of being a Korean descendant; the mean score was 4.5 with a maximum score of 5 points.

Frequency of food intake for 13 selected food groups used

in dietary pattern analysis is presented in Table 2. Korean American adolescents consumed bread, meat/meat products, fruits, milk/milk products, and soda more frequently, and fish/shellfish, bean/bean products, and coffee/tea less frequently than did adults. Diets of Korean American adolescents were somewhat more westernized than adult Korean Americans in our study, although there was no difference in frequency of kimchi and rice consumption between the two age

groups. However, the foods or food groups in our questionnaire may not well reflect westernization of adolescents' diets because it did not consider cooking methods and also did not capture teenagers' favorite foods such as hamburgers or pizza as separate items. A two-generation study of Asian Americans noted young Asians' more Americanized diets and subsequent higher intakes in fat and cholesterol compared to older Asians (Wu-Tso et al. 1995).

**Table 1.** Characteristics of subjects

	Adults (n = 227)	Adolescents (n = 151)
Gender(%)		
Female	73.6	51.0
Male	26.4	49.0
Age (years, mean ± SD)	44.8 ± 6.4	15.7 ± 1.6
Country of birth(%)		
Korea	98.2	45.7
The US	0.9	52.3
Other	0.9	2.0
Ease of communication in English (%)		
Unable to communicate	1.4	0.7
Can communicate only on a basic level	39.1	0.7
Every day conversation is possible but can't communicate intimately	45.0	15.2
Full capable of communicating in English at any level	14.5	83.4
Age of arrival in the US (years, mean ± SD)	29.6 ± 8.0	7.4 ± 4.9 <sup>1)</sup>
Length of stay in the US (years, mean ± SD)	15.4 ± 7.1	8.8 ± 4.6 <sup>1)</sup>
Perceived satisfaction with life in the US (5-point scale, mean ± SD) <sup>2)</sup>	3.83 ± 0.85	NA <sup>3)</sup>
Perceived adaptation to the life in the US (5-point scale, mean ± SD) <sup>2)</sup>	3.72 ± 0.82	NA
Perceived comparison of life in the US with life in Korea (%)		
Better in Korea	9.4	
Not different	22.8	NA
Better in the US	67.8	
Language with parents (%)		
Mostly in Korean		56.2
Both in Korean and English	NA	26.5
Mostly in English		17.3
Self-ethnic identity (5-point scale, mean ± SD) <sup>4)</sup>	NA	3.54 ± 1.00
Pride of being a Korean descendant (5-point scale, mean ± SD) <sup>2)</sup>	NA	4.29 ± 0.83

<sup>1)</sup>Korea-born only  
<sup>2)</sup>Likert-type scaling; 1 = not at all, 3 = neutral, 5 = very well (or very much)  
<sup>3)</sup>Not available  
<sup>4)</sup>Likert-type scaling; 1 = completely American, 3 = half American, half Korean, 5 = completely Korean

## 2. Dietary patterns by factor analysis approach

The three factors, "healthful", "Korean", and "western" patterns, explained 49.7% and 47.6% of the total variance in

**Table 2.** Food frequency per week of selected food groups

Food group	Adults (n = 227)	Adolescents (n = 151)
Rice	9.84 ± 3.89 <sup>1)</sup>	9.95 ± 3.94
Bread**	5.53 ± 3.28	6.69 ± 4.18
Noodle/pasta	2.90 ± 2.27	2.85 ± 2.16
Meat/meat products***	4.53 ± 2.96	6.77 ± 4.02
Fish/shellfish**	3.73 ± 2.56	2.98 ± 2.78
Kimchi	9.02 ± 4.09	8.34 ± 4.78
Vegetables	9.91 ± 6.01	9.83 ± 6.87
Fruits*	9.27 ± 5.36	10.68 ± 6.49
Milk/milk products*	5.93 ± 4.18	7.11 ± 4.78
Bean/bean products***	4.73 ± 3.43	3.14 ± 3.18
Fruit juice	6.93 ± 4.06	7.54 ± 4.50
Soda**	4.66 ± 3.95	5.97 ± 4.75
Coffee/tea***	9.86 ± 4.81	1.74 ± 3.04

<sup>1)</sup>Mean ± SD

\*Mean values were significantly different between adults and adolescents (\*: p < 0.05, \*\*: p < 0.01, \*\*\*: p < 0.001)

**Table 3.** Factor-loading matrix for dietary pattern of Korean American adults

	Factor 1 "Healthful"	Factor 2 "Korean"	Factor 3 "Western"
Milk/milk products	0.76 <sup>1)</sup>	-0.18	0.01
Fruits	0.75 <sup>1)</sup>	0.04	0.00
Vegetables	0.65 <sup>1)</sup>	0.24	-0.08
Fruit juice	0.61 <sup>1)</sup>	-0.04	0.28
Bean/bean products	0.60 <sup>1)</sup>	0.15	0.01
Rice	0.07	0.85 <sup>1)</sup>	-0.04
Kimchi	0.18	0.78 <sup>1)</sup>	0.04
Bread	0.38	-0.51 <sup>1)</sup>	0.15
Meat/meat products	0.18	0.17	0.71 <sup>1)</sup>
Soda	-0.07	-0.11	0.65 <sup>1)</sup>
Coffee/tea	-0.16	0.01	0.55 <sup>1)</sup>
Fish/shellfish	0.19	0.45 <sup>1)</sup>	0.51 <sup>1)</sup>
Noodle/pasta	0.21	-0.18	0.51 <sup>1)</sup>
% variation explained	20.2	15.3	14.2

<sup>1)</sup>Food or food group with absolute factor loadings greater than 0.4

adults and adolescents, respectively (Table 3, 4). Although the patterns were named alike in both age groups, the foods or food groups contributing to each pattern and the factor loadings were not identical. For both age groups, “healthful” pattern was characterized by high loading on milk/milk products, fruit, fruit juice, and bean/bean products. “Korean” pattern had high loading on rice and kimchi. “Western” pattern was characterized by high loading on meat/meat products, soda, and noodle/pasta. Vegetable group was identified as “healthful” in adults but as “Korean” in adolescents. Bread had high negative loading (−0.51) in adults, resulting in being included within “Korean” pattern, while it was identified as “western” pattern in adolescents. Coffee/tea was not assigned

to any pattern because frequency of consumption was very low in adolescents.

Yang et al. (2005) defined dietary patterns among 497 first generation Korean Americans using a 93-item food frequency questionnaire. The researchers identified “vegetables/fruit” and “traditional Korean” patterns in both men and women, which were similar to “healthful” and “Korean” patterns in our study, respectively, although foods or food groups contributing to each pattern varied due to different survey instruments. They also found “acculturated American” pattern in men and “traditional American” in women, which were close to “western” pattern derived in our study. It seems that traditional/Korean and western/American patterns are major dietary patterns among Korean Americans.

**Table 4.** Factor-loading matrix for dietary pattern of Korean American adolescents

	Factor 1 “Korean”	Factor 2 “Healthful”	Factor 3 “Western”
Kimchi	0.80 <sup>1)</sup>	0.07	0.04
Rice	0.75 <sup>1)</sup>	0.01	−0.01
Vegetables	0.62 <sup>1)</sup>	0.16	0.39
Fish/shellfish	0.48 <sup>1)</sup>	0.18	−0.13
Fruit juice	−0.16	0.74 <sup>1)</sup>	0.07
Milk/milk products	0.09	0.69 <sup>1)</sup>	0.04
Bean/bean products	0.28	0.61 <sup>1)</sup>	0.03
Fruits	0.36	0.55 <sup>1)</sup>	0.03
Coffee/tea	0.12	0.28	0.16
Meat/meat products	0.05	−0.02	0.73 <sup>1)</sup>
Noodle/pasta	0.21	−0.03	0.73 <sup>1)</sup>
Soda	−0.21	0.31	0.60 <sup>1)</sup>
Bread	−0.17	0.39	0.52 <sup>1)</sup>
% variation explained	22.3	14.5	10.8

<sup>1)</sup>Food or food group with absolute factor loadings greater than 0.4.

### 3. Dietary patterns and acculturation

Tables 5 and 6 present the associations between dietary patterns and demographic and acculturation variables in adults and adolescents, respectively. In Korean American adults, none of perceived scales of acculturation were associated with dietary patterns. Women tended to have higher scores of “healthful” pattern but lower scores of “western” pattern than men, while there was no association of gender with “Korean” pattern. Previous studies have also reported that women were likely to have higher scores of healthy dietary patterns (Kerver et al. 2003; Park et al. 2005; Williams et al. 2000).

“Korean” pattern was more associated with acculturation variables considered than were the other patterns. The older Korean American adults were, the higher scores of “Korean” dietary pattern they had. Also, the length of stay in the US

**Table 5.** Multiple regression analysis with three dietary patterns and selected demographic and acculturation variables in Korean American adults

Independent variable	“Healthful”		“Korean”		“Western”	
	$\beta$ <sup>1)</sup>	P	$\beta$	P	$\beta$	P
Female gender	<b>0.283</b>	<b>&lt;0.001</b>	−0.092	0.161	<b>−0.155</b>	<b>0.024</b>
Age (years)	−0.068	0.801	<b>0.579</b>	<b>0.030</b>	−0.194	0.484
Age of arrival in the US (years)	0.267	0.438	−0.650	0.059	0.163	0.648
Length of stay in the US (years)	0.164	0.579	<b>−0.747</b>	<b>0.012</b>	0.236	0.440
Ease of communication in English <sup>2)</sup>	0.072	0.345	<b>−0.174</b>	<b>0.022</b>	−0.051	0.517
Perceived satisfaction with life in the US <sup>3)</sup>	0.137	0.092	−0.007	0.932	0.016	0.845
Perceived adaptation to the life in the US <sup>3)</sup>	−0.058	0.475	0.050	0.541	0.085	0.317
Perceived comparison of life in the US with life in Korea <sup>4)</sup>	−0.098	0.149	−0.055	0.413	−0.049	0.486

<sup>1)</sup>  $\beta$  is standardized multiple regression coefficient. Values in bold are statistically significant at  $P < 0.05$ .

<sup>2)</sup> Full capable of communicating at any level / every day conversation is possible but can't communicate intimately vs. can communicate only on a basic level / unable to communicate.

<sup>3)</sup> 5 – 4 vs. 3 – 1 point (5 = very much, 1 = not at all).

<sup>4)</sup> Better in the US vs. not different / better in Korea

**Table 6.** Multiple regression analysis with three dietary patterns and selected demographic and acculturation variables in Korean American adolescents

Independent variable	"Korean"		"Healthful"		"Western"	
	$\beta^{1)}$	P	$\beta$	P	$\beta$	P
Female gender	0.134	0.102	-0.116	0.164	<b>-0.169</b>	<b>0.044</b>
Age (years)	0.053	0.520	<b>-0.220</b>	<b>0.010</b>	0.015	0.859
Ease of communication in English <sup>2)</sup>	-0.140	0.103	-0.070	0.419	0.120	0.172
Language spoken with parents <sup>3)</sup>	-0.056	0.513	-0.054	0.537	0.055	0.534
Self-ethnic identification <sup>4)</sup>	-0.029	0.732	-0.014	0.872	-0.027	0.758
Pride of being a Korean descendant <sup>5)</sup>	<b>0.227</b>	<b>0.006</b>	-0.019	0.814	0.055	0.509

<sup>1)</sup>  $\beta$  is standardized multiple regression coefficient. Values in bold are statistically significant at  $P < 0.05$ .

<sup>2)</sup> Full capable of communicating at any level vs. every day conversation is possible but can't communicate intimately / can communicate only on a basic level / unable to communicate.

<sup>3)</sup> Both in Korean and English / mostly in English vs. mostly in Korean.

<sup>4)</sup> 5 - 4 vs. 3 - 1 point (5 = completely Korean, 1 = completely American).

<sup>5)</sup> 5 vs. 4 - 1 point (5 = very much, 1 = not at all)

and English level were negatively associated with "Korean" pattern. These two variables have been very often used as an indicator for acculturation in many studies (Gordon et al. 2000; Han 1998; Lee et al. 1999; Lv, Cason 2004; Park et al. 2003; Song et al. 2004). Han (1998) reported that the older the subjects and the shorter the stay in the US, they were more likely to consume Korean foods from the study of 157 first generation Korean Americans in Hawaii. These findings are consistent with a recent study reporting negative association between "traditional Korean" pattern and length of residence in the US (Yang et al. 2005). "Health" and "western" pattern were not associated with acculturation variables in our study.

Among Korean American adolescents, girls had lower scores on "western" patterns than did boys. Age was inversely associated with "healthful" pattern in adolescents. The interesting finding was that adolescents who had felt more proud of being a Korean descendant showed higher scores on "Korean" dietary pattern. Ethnic food orientation is one of the essential factors for cultural or ethnic identity (Ashraf et al. 1999; Kwan 2000). Therefore, making efforts to introduce excellence in traditional dietary culture into Korean American adolescents is important for developing ethnic identity as well as for achieving good health.

## Summary and Conclusion

This study defined dietary patterns among 227 Korean American adults and 151 teenagers living in California using frequency of intake of major food groups, and examined associations of dietary patterns with selected demographic

and acculturation variables.

"Healthful", "Korean", and "western" patterns were identified using factor analysis among adults and adolescents respectively. For both age groups, "healthful" pattern was characterized by high loading on milk/milk products, fruit, fruit juice, and bean/bean products. "Korean" pattern had high loading on rice and kimchi. "Western" pattern was characterized by high loading on meat/meat products, soda, and noodle/pasta. Vegetable group was identified as "healthful" in adults but as "Korean" in adolescents. Bread had high negative loading in adults, resulting in being included within "Korean" pattern, while it was identified as "western" pattern in adolescents.

Among Korean American adults, women tended to have higher scores of "healthful" pattern but lower score of "western" pattern compared with men, while there was no association of gender with "Korean" pattern. The older adults were likely to have higher scores on "Korean" dietary pattern. Length of stay in the US and English levels were negatively associated with "Korean" pattern. Korean American female adolescents had lower scores on "western" patterns than did male adolescents. Age was inversely associated with "healthful" pattern in adolescents. The adolescents who had felt more proud of being a Korean descendant had higher scores on "Korean" dietary pattern.

There are some cautions for interpretation of our results. Food frequencies of selected food groups may not be various enough to reflect usual food consumption patterns. Nevertheless, we were able to identify distinct dietary patterns among Korean Americans that are comparable to patterns derived in the previous study (Yang et al. 2005). A relatively small num-

ber and convenient sample of Korean Americans living in California may not be representative to over one million Koreans in the US. Unfortunately we had no information on disease risk or health outcome, although overall dietary patterns are useful to examine the relationship with health. In spite of the limitations, the study found that dietary patterns defined here were associated with acculturation variables; length of residence in the US and English fluency for adults, and pride in ethnicity for adolescents among Korean Americans. Further studies are necessary to understand associations of dietary patterns and acculturation with health risks of ethnic groups.

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