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In-Depth Assessment of the Nutritional Status of Korean American Elderly

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Abstract

While studies of immigrants have generally indicated significant dietary changes upon immigration that mirror a Western diet, previous data are limited to the dietary patterns and intakes of younger and middle-aged adults. Using a relatively large sample of Korean American elderly (KAE) immigrants, this paper offers an in-depth assessment of the nutritional status of KAE, one of the most rapidly increasing minority populations in the United States. A total of 202 KAE in a metropolitan city on the East coast participated in a comprehensive nutritional survey using 24-hour dietary recall. Despite their spending about 16 years in the U.S., the KAE consumed more than two regular meals in a day which qualified under a Korean food pattern. When compared with the National Health and Nutrition Examination Survey III, the average consumption of nutrients reported was generally lower than Americans, with the exception of carbohydrates, vegetable protein, and sodium intakes. Inadequate intakes of calcium, dietary fiber, and folate were notable when examined in comparison to the Dietary Reference Intakes. The findings can help healthcare providers and researchers to design appropriate nutritional education programs to facilitate the adoption of healthier dietary practices in this immigrant population. In particular, future interventions should consider ways to lower sodium intake and increase fruit and vegetable consumption among KAE, while encouraging them to maintain their healthy dietary pattern.

INTRODUCTION

Numerous studies have reported on the significant impact of dietary intake on health, independence, and quality of life in the elderly population.[1-3] For example, it is well known that several critical nutrients such as calcium, protein, magnesium, zinc, and vitamin C significantly influence the development and maintenance of bone mass and the prevention and treatment of osteoporosis.[4] Animal fats are associated with an increased risk of coronary heart

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disease,[5] whereas intake of total vegetables, legumes, and fruit is significantly inversely associated with cardiovascular disease and cancer mortality.[6-9]

While some counter examples exist,[10,11] researchers have documented general changes in dietary patterns among immigrants from Eastern countries that mirror a Western diet after migration (i.e., increased consumption of animal protein, animal fats, and refined sugar).[12-17] Indeed, the research regarding the dietary intake of Korean Americans, one of the fastest growing immigrant populations in the U.S.,[18] has generally indicated an increase in the consumption of beef, dairy products, soda, bread, cereal, ham, and sweets as well as a decrease in the intake of fish and rice and other grains in the population.[13,14,19-23] However, previous studies have been limited to the dietary practices of adolescents or younger and middle-aged adults. Only few published studies examined the topic in older groups of Korean immigrants with small sample sizes (< 100) with no in-depth assessment of their nutritional status.[24,25]

As the proportion of elderly immigrants increases exponentially in the U.S.,[26] understanding and addressing their health needs have emerged as important public health policy tasks. More detailed information on the nutritional intakes and dietary patterns of Korean American elderly (KAE) would be helpful in assisting healthcare providers with adequate dietary assessment and nutritional education, counseling, and support in this rapidly increasing immigrant population. In light of these considerations, we conducted a comprehensive assessment of their dietary pattern and nutritional status using a relatively large sample of KAE. Specifically, the objectives of this study were to: (1) describe KAE's dietary pattern and nutritional status based on 24-hour dietary recall; (2) compare their nutrient intake values with those from the most recent national nutrition survey (i.e., the National Health and Nutrition Examination Survey [NHANES] III); and (3) determine adequacy of their nutrient intake using the Dietary Reference Intakes.[27]

METHOD

Sample

The data were taken from a dietary assessment conducted on 202 Korean Americans, aged 60 years or older. Methods used and findings on the participants' health status were previously published.[28,29] In brief, the sampling frame included KAE whose names were drawn from the membership roll of **an inner-city Korean Senior Center**, from a telephone listing of people with Korean surnames, and from a database from a previous community survey by the research team. Eligibility criteria included: (1) Korean immigrant from the Republic of Korea and (2) age 60 years or older. Of the 612 on the list, we were able to contact 411 by telephone after a maximum of 5 attempts at different times on different days. About 61% of those contacted (N=250) volunteered for the study, 45 of whom were unable to participate because of schedule conflicts and 3 did not complete 24-hour dietary recall, resulting in a total of 202 in the final sample for this analysis.

Procedures and Measures

After IRB approval, consent was obtained from each study participant before data collection. Data were collected at the General Clinical Research Center by trained bilingual nurses who subjectively assessed the KAE's cognitive status based on several basic questions (e.g., name, age, address, and telephone number). Using a structured study questionnaire, detailed information about sociodemographics, physical activity, and dietary intakes were obtained via face-to-face interviews. The level of physical activity was assessed based on the type, amount, and frequency of physical activities performed during the last week prior to the study. Example questions included: “How often did you perform at least 10 minutes of vigorous physical activity (e.g., race walking, running, bicycling) to increase heart beat or get rubbery legs in the

last month? When did you do such workout, how long did you do?" or "How often did you perform moderate (e.g., brisk walking, swimming, mowing lawn) or low intensity activities (e.g., slow walking, gardening, dusting, light stretching) more than 10 minutes without stopping? How long did you perform each time?" Following the guidelines by the Centers for Disease Control and Prevention,[30] participants were categorized as being 'active' if they had performed moderate activities for 5 or more days of the week (in bouts of at least 10 minutes for a total of at least 30 minutes per day) or vigorous activities (for at least 20-60 minutes per day) for 3 or more days of the week.

Dietary interviews were conducted by collecting a 24-hour dietary recall. This method has been reliable in obtaining dietary intake information from diverse groups.[20,31,32] Participants were asked to start with the most recent meal or snack that they had consumed and work backwards to cover all foods and beverages consumed in the last 24 hours. Once consumed foods were identified, portion sizes and preparation methods were recorded in the next step. Because some KAE are neither familiar with nor are regular users of American household measurements in cooking (e.g., teaspoons or ounces), bilingual nurse interviewers used a culture-specific food recall kit including standard sized containers for staple dishes (e.g., rice, bean paste soup, *kimchi*, etc.) and measuring cups for liquid. Participants were encouraged to describe foods as clearly as possible. Several probing questions were asked to help them to recall: "Did you eat or drink anything with this?" "Did you eat or drink before or after that?" "When you watched TV last night, did you eat anything?" "What else did you have at this meal?" Once the 24-hour dietary recall was complete, interviewers read the list of foods back to the participant to confirm whether the recall was correct or whether there was any food that they forgot to mention.

The dietary patterns of the KAE were assessed based on 24-hour dietary recall data in the following three categories: a Korean food pattern, an American food pattern, and a common (Korean and American) food pattern. These three patterns were divided according to a classification by Lee et al.[33] Specifically, a 'Korean food pattern' was based on foods consumed frequently in Korea but rarely in America (e.g., cooked rice, tofu, *kimchi*, soybean paste, Korean soup or stew). An 'American food pattern' consisted of foods usually consumed in America but rarely consumed by the elderly in Korea, such as hamburgers, hot dogs, breakfast cereal, bread, pizza, and skim or low-fat milk. A 'Common food pattern' was based on foods that were consumed frequently in both Korea and America, such as lettuce, eggs, fish, whole milk, beef, apples, or carrots.

Data Analysis

All food data (frequency and amount) were entered into the Computer Aided Nutritional Analysis Program 2.0 (CAN pro 2.0) by a trained research assistant. The CAN pro 2.0 allows the researcher to easily calculate the amount of calories (Kcal) and nutrients (e.g., carbohydrate, fat, protein, vitamin A, etc.) consumed per day by adding nutrients and calories from each entered food item. It was developed by the Korean Nutrition Society[34] for nutritional evaluation of Korean individuals, and has been used in Korean elderly studies.[35,36] The amount of nutrients and calories were summarized using descriptive statistics. KAE's dietary pattern (i.e., Korean, American, or common food patterns) was analyzed in two ways: first, we added the number of food items consumed per day for each food pattern and, then, individually assessed food items consumed at each meal to determine appropriate dietary pattern[33] and code them accordingly. Coded dietary patterns for the individual at each meal were summed to derive the dietary pattern of the sample.

We also compared the participants' nutrient intake data with nutrient intake data from the NHANES III.[37] The NHANES III was conducted on a probability sample of 33,994 persons (≥ 2 months or older) and contains nationally representative information on the health and nutritional status of the U.S. population. Using a series of independent sample *t*-tests, we

compared NHANES III data on individuals of 60 years and older (N = 5,039) with the nutritional status of our sample. Since we conducted 18 comparisons of dietary intakes between the two groups, the significance level for these tests was adjusted using Bonferroni correction (p values of 0.0028 or lower were determined to be statistically significant).

Finally, adequacy of nutrition intake was calculated using the Dietary Reference Intakes (DRIs). The DRIs are a comprehensive set of nutrient reference values encompassing Estimated Average Requirement (EAR), Adequate Intake (AI), Tolerable Upper Intake Level (UL), and Recommended Dietary Allowance (RDA).[27] Currently, published DRI values are available for the aggregated age groups of 51-70 years and > 70 years, separately for men and women. We used specified DRI values depending on the age (i.e., 51-70 years vs. > 70 years), activity level (sedentary, low active, active, very active), and gender (male vs. female) of the participant. The EAR is the intake value that is estimated to meet the requirement defined by a specified indicator of adequacy in 50 percent of an age- and gender-specific group. The AI is a recommended intake value based on observed or experimentally determined approximations or estimates of nutrient intake by a group (or groups) of healthy people that are assumed to be adequate—used when an RDA cannot be determined. The UL is the maximum level of daily nutrient intake that is unlikely to pose risks of adverse health effects to almost all of the individuals in the group for whom it is designed. The RDA is the dietary intake level that is sufficient to meet the nutrient requirements of nearly all individuals in the group. In this analysis, we calculated percentages of KAE who had an intake of less than 75% of the RDA as a criterion of dietary inadequacy at the community level.[38]

RESULTS

Sample Characteristics

The average age for the KAE in the analysis was 69.7 (±6.5) years (range = 60 to 89). The sample consisted of 73 men and 129 women. All were born in Korea, with the mean length of stay in the U.S. being 15.9 (±6.6) years. Nearly 40% of KAE reported having a high school or lower level of education. When asked to rate their health compared to others of the same age, 54.4% perceived themselves in poor or very poor health. Nearly all study participants (97%) reported little or no English skills. Most study participants (86.6%) reported that they were low active during the last month prior to the data collection; less than 1 in 5 (13.4%) reported being active during the last month prior to the data collection.

Dietary Patterns

Table 1 also presents the dietary patterns of the KAE in three different categories. Specifically, the sample consumed an average of 8.9 Korean food items compared to about 2 and 1 food item in American and Common food categories, respectively. Likewise, study participants had consumed more than two regular meals in a day (2.3±0.7 meals) which qualified under a Korean food pattern. Only 0.5 (±0.6) of their daily meals fell under the American food pattern.

Comparison of dietary intakes

When compared, varying degrees of statistically significant differences were found in the total calorie intake and the proportion of carbohydrate, protein, and fat intake between KAE and the NHANES III. The total calorie intake in KAE was lower than that reported in the NHANES III (1,520.5±36.0 Kcal vs. 1,719±17.4 Kcal), though the percentage of total calories from protein in KAE was higher than the percentage in the NHANES III (18.2% vs. 16.1%).

Overall, intakes of nutrients in KAE were significantly lower than amounts seen in the NHANES III, with the exception of carbohydrates, vitamin B2, and sodium levels. In particular, KAE consumed a significantly greater amount of sodium in comparison to the NHANES III

(3,865.6±123.0 mg/day vs. 2,869.0±42.1 mg/day). Total protein and animal protein (e.g., meat, fish, poultry, milk, eggs) intake in KAE was lower than the intake in the NHANES III, while the level of vegetable protein consumption (e.g., beans, soy, tofu, nuts, whole grain) was higher (Table 2)

Adequacy of nutrient intakes

Dietary intakes of vitamin A, vitamin C, vitamin B1, vitamin B2, and Niacin in KAE met or were slightly lower than DRI standards, but carbohydrate (180.7%) and protein (124.3%) intake exceeded the reference values. Sodium intake was especially high at a level 168% higher than the UL (2,300 mg/day). In contrast, total calorie intakes (71.5%), folate (64.4%), calcium (40.8%), and fiber (28.0%) fell below the DRIs standards (Table 3).

Table 4 displays the percentages of the sample with estimated dietary intakes of less than 75% of the RDA. The most notable deficiencies were observed in dietary fiber and calcium. More than 9 out of 10 KAE reported intakes of dietary fiber and calcium below 75% of the RDA. In addition, many KAE did not meet 75% of the RDA for folate. However, intakes of carbohydrate and dietary sodium were well above 75% of the RDA for most KAE.

DISCUSSION

Previous studies of immigrants have often examined food and nutrient intake, but not entire dietary patterns. Despite the relatively long periods of time spent in the U.S., the KAE in this study consumed more than two out of three regular meals a day in the Korean food pattern. The result indicates that length of residence in the U.S. may not have strong effects on the diets of older Korean immigrants, in contrast with their younger counterparts whose dietary patterns often adopt more acculturated food items.[13,14,19-23,33] For many of the study participants, the easy access to Korean grocery stores might have been a factor for the dominant Korean diet pattern seen in this study. Another possible explanation is that, as several researchers[19] noted, for elderly immigrants traditional diets may be associated with the preservation of ethnic identity. Our finding implies that nutritional intervention may be effective only when different strategies are considered separately for younger and older age groups of Korean Americans due to their different dietary patterns and acculturation status.

The percentage of total calories from fat in KAE was lower than that found in the NHANES III, while the percentage of total calories from protein and vegetable protein consumption were significantly higher. The finding might have been due to this age group's primary consumption of traditional Korean foods. Traditional Korean diet is characterized by high intakes of soybean-based foods (e.g., tofu, soybean paste stew), Korean style of grains, *kimchi*, and seaweed, and low intakes of high-fat dairy products, red meat, butter, salad dressing, margarine, bread, and processed meat.[14] It is well known that a diet rich in animal fats from red meat and high fat dairy products increases the risks of coronary heart disease and certain types of cancer.[5,6] In contrast, recent studies have indicated soybean protein (i.e., vegetable protein) as a possible source of prevention against cardiovascular disease and deaths in older adults.[7-9] Hence, encouraging the maintenance of the traditional Korean diet that is rich in soybean protein and low in animal fats would be a natural and culturally sensitive nutritional intervention strategy targeting Korean Americans. Public awareness campaigns focusing on the benefits of traditional Korean diet may help KAE to maintain and further promote their healthy dietary habit.

The sodium intake was notably high in KAE. Fermented foods that use salt as a preservative such as *kimchi* and soybean paste are important staples of the Korean diet. The average salt intake of the average Korean person is known to be 15-20g/day,[39] which is 3-4 times higher than the recommended quantity and far more than that of the Western intake of 6g/day on

average.[2] As people age, the ability of aged kidneys to excrete sodium decreases, thus representing a major factor responsible for the rise in blood pressure in the elderly.[40] While the prevalence of high blood pressure in KAE is nationally high,[29] the excessive consumption of sodium in KAE strongly supports the need for better recognition of this risk factor in their diet. Behavioral interventions, including comprehensive education and counseling on reducing sodium intake, have been successful in reducing dietary sodium intake in younger (mean age = 43 years) and predominantly white (> 75%) samples.[41] Future studies are warranted to find out whether previously effective behavioral intervention strategies can also reduce dietary sodium intake in the KAE population.

As shown in prior research of Asian elderly,[33] deficiency in calcium intake among KAE was notable. One possible explanation may be that many KAE are not used to consuming milk or dairy products for calcium intake.[19] Some KAE do not prefer to consume milk and dairy products because Koreans consider milk as a food of nourishment for the young and not as a necessary element of the diet for proper nutrition for adults.[24] Another explanation for the low intake of dairy products among KAE may be deficiencies in lactase, an enzyme required to metabolize the primary milk sugar lactose.[42] Calcium intake could significantly impact bone health and is considered important in the prevention of high blood pressure as an induced stabilizer of cell membranes and reduced vascular constriction.[43] Healthcare providers encountering KAE may need to assess the KAE's consumption of nutrient supplementation and calcium-rich foods (e.g., calcium containing juice, leafy green vegetables such as spinach) and educate them with simple ways to increase calcium intake. In addition, further research is needed to explore factors related to lower calcium intake by KAE and relevant disease outcomes.

Nearly all participants in our sample had estimated dietary fiber intakes of below 75% of the RDA. While the traditional Korean diet includes *kimchi*, a spicy traditional dish made with Korean cabbage (or various vegetables such as cucumber or horseradish), the result indicates that *kimchi* alone might not have been a sufficient source of dietary fiber for KAE. Published guidelines by the USDA[3] underscore the importance of a high fiber diet in preventing cardiovascular disease and colon cancer. Promoting the consumption of fruits and vegetables, whole-grain rice, or nut products may be a useful strategy to increase the daily intake of dietary fiber in KAE.

Despite a marked increase in the folate status of Americans as a result of required fortification by the Food and Drug Administration since 1998 through enriched cereal-grain products,[44] this study showed considerably insufficient intake of folate among KAE. The result reflects the traditional Korean dietary pattern observed in our sample, which is based on rice instead of bread, rolls, and crackers, which are the largest contributors of total folate to the American diet. A similar result was reported in a study using a national sample of Taiwanese elderly whose diet is also based on rice. In the study,[45] nearly half of the sample had a dietary folate intake below 2/3 of the RDA. These results indicate the strong need for increasing awareness of issues surrounding folate along with promotion of folate-rich foods to assist this population with optimizing their health status.

Limitations were present in our study, one of them being that we used the 24-hour dietary recall method to collect data. While the method relies on the subjects' short-term recall ability, it has been reliable in obtaining dietary intake information from diverse groups.[46,47] Our sample reported no changes in their usual eating patterns on the day prior to the interviews. Our study participants were mobile in that they were able to walk independently and visit the study site for 2-hour data collection. As a result, less mobile and unhealthy elderly individuals were not included, potentially introducing some selection bias.

CONCLUSION

We found that KAE generally maintain their traditional dietary pattern that is centered on rice, soybean, and fermented foods that use salt as a preservative (e.g., *kimchi*). While the traditional Korean diet that is rich in vegetable protein and low in animal fats offers some health benefits, the findings suggest a need for interventions to facilitate the adoption of healthier dietary practices. In particular, future interventions should consider ways to lower sodium intake and increase fruit and vegetable consumption among KAE. The findings also indicate a need for continued research to gain a better understanding of the nutritional status of KAE. Specifically, further research is needed to explore variables that affect the nutrient intake of KAE, and to identify chronic conditions closely related to their nutrient intake (e.g., high blood pressure, osteoporosis).

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Table 1

Sample characteristics and dietary pattern of KAE (N = 202)

Variable	Total
Age, years (±SD)	69.7±6.5
Residence in the USA, years (±SD)	15.9±6.7
Gender, n (%)	
Male	73(36.1)
Female	129(63.9)
Education level, n (%)	
High school >	124(61.4)
High school or less	78(38.6)
Perceived health, n (%)	
Very good/good	91(45.6)
Poor/very poor	124(54.4)
English proficiency, n (%)	
Good	6(3.0)
Poor/None	196(97.0)
Physical activity, n (%)	
Active	27(13.4)
Low active	175(86.6)
Food items consumed for each dietary pattern, No/day (±SD)	
Korean food pattern	8.9±3.9
American food pattern	1.1±1.4
Common food pattern	2.3±1.9
Number of meals for each dietary pattern, times/day (±SD)	
Korean food pattern	2.3±0.7
American food pattern	0.5±0.6
Common food pattern	0.1±0.3

Table 2

Comparison of nutrient intakes between KAE and NHANES III

	KAE (Mean ± SE)	NHANES III (Mean ± SE)	
	Total (N=202)	Total (N=5,039)	*t*-value
Calories (Kcal)	1,520.5±36.0	1,719±17.4	−4.96*
Carbohydrate/Calories (%)	70.5±0.6	51.7±0.3	28.03*
Protein/Calories (%)	18.2±0.3	16.1±0.1	6.64*
Fat/Calories (%)	11.3±0.4	32.2±0.2	−46.73*
Carbohydrate (g)	234.9±5.4	219.0±2.4	2.69
Fat (g)	39.0±1.7	63.0±0.8	−12.77*
Total protein (g)	61.6±1.8	68.0±0.8	−3.25*
Protein (vegetable) (g)	31.2±0.9	22.0±0.3	9.70*
Protein (animal) (g)	30.5±1.5	44.0±0.6	−8.36*
Vit A (IU)	2,483.9±46.8	7,238±169.5	−27.04*
Vit C (mg)	85.7±4.0	108.0±2.2	−4.88*
Vit B1 (mg)	1.1±0.1	1.6±0.0	−4.90*
Vit B2 (mg)	1.9±0.0	1.9±0.0	0.00
Niacine (mg)	13.9±0.5	20.9±0.3	−12.00*
Folate (ug)	257.5±9.6	296.0±5.5	−3.48*
Calcium (mg)	490.2±17.6	735.0±9.9	−12.12*
Fiber (g)	6.7±0.3	17.0±0.2	−28.57*
Sodium (mg)	3,865.6±123.0	2,869±42.1	7.67*

* Statistically significant at $p \leq 0.028$ after adjusting for multiple comparisons.

Table 3

Nutrients intake in KAE compared with DRIs[a] (N = 202)

	% of DRI±SE
Calorie	71.5±1.6
Carbohydrate	180.7±4.1
Protein	124.3±3.6
Vit A	98.4±6.1
Vit C	107.4±5.0
VIt B1	97.0±4.6
Vit B2	92.0±3.2
Niacin	93.8±3.4
Folate	64.4±2.4
Calcium	40.8±1.5
Fiber	28.0±1.2
Sodium[b]	168.1±5.3

[a] DRIs mean Dietary Reference Intakes.[27]

[b] Sodium levels are based on Tolerable Upper Intake Levels in DRI.

Table 4

Proportion of KAE whose nutrients intake was less than 75% of the RDA[c] (N = 202)

	n (%)
Calorie	127 (62.9)
Carbohydrate	4 (2.0)
Total protein	30 (14.9)
Vit A	98 (48.5)
Vit C	75 (37.1)
Vit B1	87 (43.1)
Vit B2	81 (40.1)
Niacin	81 (40.1)
Folate	143 (70.8)
Calcium	188 (93.1)
Fiber	200 (99.0)
Sodium	2 (1.0)

[c] RDA means Recommended Dietary Allowance.[27]