Nutritional Sciences 2(2), November, 1999, pp. 107-112

Comparison of Nutrient Intakes of Elderly Korean and American Women Using Diet Quality Index

Chin-Eun Chung[1§] and Sungsoo Cho[2]

[1]*Department of Food and Nutrition, Ansan College, Ansan, Kyunggi-Do 425-150, Korea*
[2]*Kellogg Institute, Battle Creek, Michigan 49017, U.S.A.*

ABSTRACT

Diet quality index (DQI) offers a new way of comparing eating habits across populations and across countries. Nutrients and food consumption data from 100 elderly Korean women aged 65 and older were collected in Seoul or Kyunggi-do, Korea by the 24 hour recall method. Diet quality index (DQI) was computed for 1049 elderly women (65 and older) from the 1994 – 1996 Continuing Survey of Food Intakes by Individuals (CSFII) in the US according to US dietary guidelines, and applied to the diet of elderly Korean women for purposes of comparison. A modified 16-point DQI awarded 2 points each for moderate consumption of fat (≤ 30% energy), saturated fat (≤ 10%), cholesterol (≤ 300 mg/day), sodium (≤ 2400 mg/day), and protein (≤ 100% RDA), adequate intakes of carbohydrate (≥ 50% energy) and calcium (≥ 100% RDA), and plenty of fruits and vegetables (≥ 5 servings). Criteria were based on US dietary guidelines. Partial scores were given if subjects were close to meeting these cutoff points. Diets with ≤ 300 mg cholesterol/day were reported by 97% of the Korean sample and 82% of the American sample, while 90% of the Koreans and 42% of the Americans met the goal of ≤ 30% of energy from fat, and 98% of the Koreans and 47% of American met the recommendation of ≤ 10% of energy from saturated fat. In contrast, only 8% of the Korean sample met the sodium recommendation of ≤ 2400 mg sodium per day, whereas 54% of the American subjects met this goal. The mean DQI scores were 10.1 for the elderly American women and 11.3 for the elderly Korean women. Overall, the elderly Korean diet was more consistent with the US dietary guidelines than the elderly American diet.

KEY WORDS: diet quality index (DQI), dietary guidelines, recommended dietary allowance, CSFII data.

INTRODUCTION

Many clinical and epidemiological studies have addressed the impact of diet on chronic disease risk. In most cases, the focus has been on the role of individual nutrients and foods and their relationship to selected health outcomes. For example, the high consumption of fats and saturated fats have been linked with the increased incidence of cardiovascular disease and different forms of cancer,[1] whereas the consumption of monounsaturated fats and moderate consumption of alcohol have been associated with lower disease risks.[2][3]

Human eating behavior, however, is a complex and multidimensional phenomenon.[4-6] Given the complexity of human diets, focusing on the effect of a single nutrient or food on a specific health outcome may overlook whole diet related risks. Therefore, it is useful to examine global indices of food and nutrient intake that integrate several related aspects of dietary intake concurrently.

Assessing the quality of the total diet is a relatively new focus in nutritional epidemiology.[4-9] Although the issues of dietary variety and nutrient adequacy have been addressed previously,[9-13] nutrition research has only recently explored the issue of diet quality and begun to devise new methods for assessing healthful eating patterns.[4][9][13] One such measure, the diet quality index[4][13] has been used to assess the degree of compliance with a healthful diet as defined by dietary recommendations issued by US federal government agencies.[14-16] In some studies, low-scoring diets characterized by omission of several food groups were associated with increased cancer and cardiovascular disease related mortality.[17][18] But assessments of healthful eating patterns using diet quality indices have been largely limited to US populations.[5][6][9][17][18]

In recent years there has been an increasing interest in assessing the food intake and diet quality of Koreans by a variety of dietary indices.[19-27] However, an appropriate instrument for evaluating the diet quality of the Korean diet has not been developed. Therefore, evaluative criteria developed in the US[4][13] were used in the present study to assess the diet quality of elderly Korean women and to compare their diets to elderly women in the US. Overall diet quality of both ethnic groups was assessed by mod-

Accepted : November 10, 1999
[§]To whom correspondence should be addressed.

ifying the diet quality index (DQI) tool developed by Patterson *et al.*[4] and modified by Chung *et al.*.[13] The purpose of evaluating diet quality according to the US dietary standard was to shed new light on the Korean diet, and to be a foundation for developing new methodology for assessing the Korean diet.

METHODS

1. Korean data

Korean subjects were 100 elderly women aged 65 years and older residing in Seoul or Kyunggi-do Province. They were surveyed from May 1 to June 30, 1997. Students majoring in nutrition interviewed subjects with questionnaires and collected dietary intake data by the 24-hour recall method. Nutrient intakes were calculated by food composition data[28] using Nutass (Ewha computer program for nutrient analysis).[29] Mean dietary nutrients as %RDA were calculated according to the Korean Recommended Dietary Allowances.[28] Heights and weights were measured, and Body Mass Index (BMI) was computed by weight/height^2 (kg/m^2).

2. American data

Data reported in this study were obtained from the nationwide 1994-1996 Continuing Survey of Food Intakes by Individuals (1994-1996 CSFII),[30] conducted by the US Department of Agriculture. CSFII is based on a nationally representative sample of non-institutionalized individuals residing in the US. Dietary intake data were collected by two in-person interviews using 24-hour dietary recall, conducted on two non-consecutive days. Data analyses were based on mean of 2 days. Subjects selected for this analysis were 1049 women aged 65 or older.

3. Diet quality index (DQI)

As suggested earlier, the DQI instrument used in this study was a modification of the tool developed by Patterson *et al.*[4] or Chung *et al.*[13] The DQI awards points based on full or partial compliance with US dietary recommendations reported in the National Academy of Sciences' publication *Diet and Health*[1] (Table 1). The US Diet and Health recommendations are based on a multidisciplinary committee's review of epidemiological and clinical evidence linking dietary factors to chronic disease risk. This provides a standard for evaluating the diet.

In addition, the US recommendations are specific, quantitative and ranked by their public health importance.

Table 1. The criteria used for diet quality index based on US dietary guidelines

Dietary guidelines	Points given		
	0	1	2
Energy from fat (%)	> 40	30 - 40	≤30
Energy from saturated fat (%)	> 13	10 - 13	≤10
Cholesterol (mg)	> 450	300 - 450	≤300
Sodium (mg)	> 3400	2400 - 3400	≤2400
Energy from carbohydrate (%)	<44	44 - 50	≥50
Calcium (%RDA)	< 67	67 - 100	≥100
Protein (%RDA)	> 150	100 - 150	≤100
Fruit & vegetable intake (serving)	< 3	3 - 5	≥5

Criteria used for the DQI were the following: consumption of a diet containing less than 30% energy from fat (2 points); less than 10% energy from saturated fat (2 points); and less than 300 mg cholesterol per day (2 points); more than 50% of energy form starches and other complex carbohydrates (2 points); additional points were added if the diet contained adequate calcium intake (approximately RDA levels: 2 points); moderate protein intakes (less than 100% RDA: 2 points); limited sodium intakes to 2400mg (2 points); and five or more servings of a combination of vegetables and fruits (2 points). Partial scores were given if subjects were close to meeting these cutoff points. DQI scores were calculated by summing up the above points from 8 categories. Scores could range from 0 to 16. The higher the DQI score, the better the quality of diet. DQI scores were computed for both elderly US and Korean women. In the case of the Korean sample for computing DQI, a few minor modifications were made. The Korean RDA for protein and calcium were used instead of the US RDA, and Korean serving sizes for fruits and vegetables were used instead of US serving sizes.

4. Statistical analyses

A t-test was used to compare mean differences between the elderly Korean and American women using the Statistical Analysis System (SAS).[31]

RESULTS

1. Subject characteristics

The mean ages of the Korean and American samples were 72.1 years and 73.7 years respectively (Table 2). As expected, mean height and weight of the elderly American women were significantly taller and heavier than the elderly Korean women. Consequently, the BMI of American subjects was significantly higher than that of the Korean subjects.

Table 2. Subject characteristics

	Korean (n = 100)	United States (n = 1,049)
Age	72.1 ± 5.4[1)]	73.7 ± 6.8
Height (cm)	153.6 ± 5	161.9 ± 12
Weight (kg)	53.9 ± 8.1	75.5 ± 58
BMI (kg/m^2)	22.8 ± 3.2	28.1 ± 14

1) Mean ± SD

Table 3. Comparison of nutrient Intakes between elderly Korean and United States women aged 65 and older

	Korean (n = 100)	United States (n = 1049)
Energy (Kcal)	1523.3 ± 430.9[1)]	1397.6 ± 462.6**
Carbohydrate (g)	235.7 ± 54	182.9 ± 66.4**
Protein (g)	64.8 ± 28	57.5 ± 21.1*
Fat (g)	35.7 ± 22.9	50.1 ± 22.3**
Saturated fat (g)	4.5 ± 5.6	16.3 ± 8**
Cholesterol (mg)	43.4 ± 90.3	201.5 ± 128**
Calcium (mg)	437.8 ± 231.8	590.8 ± 304.5**
Iron (mg)	11.1 ± 5.4	12.1 ± 5.9[NS]
Na (mg)	5430.4 ± 2534	2411.6 ± 928.5**
Vit A (RE)	338.1 ± 233.5	1030.7 ± 1099**
Thiamin (mg)	1 ± 0.6	1.2 ± 0.5**
Riboflavin (mg)	1 ± 0.4	1.5 ± 0.7**
Niacin (NE)	12.9 ± 6.7	17.3 ± 7.2**
Vit C (mg)	75.9 ± 52.3	92 ± 65.2*

1) Mean ± SD
*Means are significantly different ($p < 0.05$) by t-test.
**Means are significantly different ($p < 0.0001$) by t-test.
NS: Means are not significantly different at $\alpha = 0.05$.

2. Energy and nutrient intakes

Energy and nutrient intakes of the subject samples are presented in Table 3. Mean energy intakes were 1523 kcal/day for the Korean sample and 1398 kcal/day for the American sample. The elderly Korean women had higher carbohydrate and protein intakes and significantly lower intakes of fat, saturated fat, and cholesterol than the group of the elderly American women. Fig. 1 outlines the nutrient composition of the Korean diet (in percentage of total energy): 64% carbohydrate, 17% protein, 19% total fat, and 3% saturated fat. Corresponding values from CSFII data for the elderly US group were: 52% carbohydrate, 16% protein, 32% total fat, and 10% saturated fat. Arguably, and allowing for differences in dietary intake methodology, the US diet of elderly women, as assessed by the CSFII data, came closer to meeting the US dietary recommendations regarding carbohydrate (≥ 50% energy). On the other hand, the Korean diet was close to the Korean dietary recommendation of 65% carbohydrate, 15% protein, 20% fat.

The elderly US women's dietary consumption of calcium and all vitamins were significantly higher than the Korean elderly, whereas sodium intake for Korean subjects was significantly higher than that for the elderly US women (Table 3).

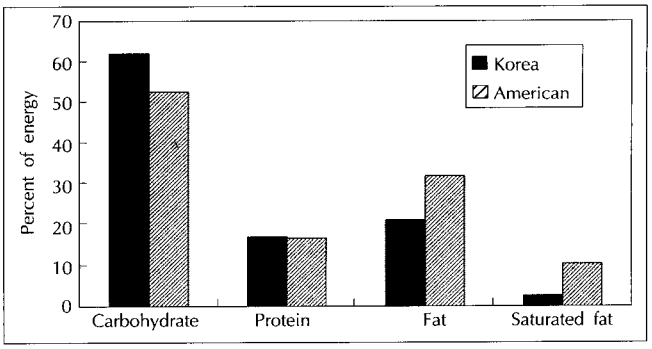

Fig. 1. Comparison of nutrient composition (%) of energy between elderly Korean and American women.

A comparison of mean dietary nutrients as %RDA between the elderly Korean and American women is presented in Table 4. The Korean women consumed less energy, calcium, iron, vitamin A, riboflavin according to Korean recommendations, but consumed more than 100% of the Korean RDA for protein and vitamin C. In contrast, the elderly American women consumed more than 100% of the US RDA for protein, iron, vitamin A, thiamin, riboflavin, niacin and vitamin C, but less energy and calcium. While energy consumption was higher as %RDA for the aged Korean women than for the elderly American women, consumption of protein and vitamin C were not significantly different between the Korean and American groups. Intakes of other nutrients (expressed as %RDA) were significantly higher for the elderly American women than for the elderly Korean women (Table 4).

3. Diet and the US health recommendations

The US dietary guidelines, as specified in the *Diet and Health* report were used to compare the Korean and US in spite of obvious differences in the diets of both countries. The proportion of respondents whose diets were consistent with the US dietary guidelines is shown in Table 5.

Approximately 42% of the US subjects met the most important recommendation of keeping total fat intake to less than 30% of energy, and 47% met the guidelines of reducing saturated fat intake to less than 10% of energy. Most elderly American women (82%) met the cholesterol goal of 300 mg per day, but only 35% consumed a diet containing more than 50% of energy from carbohydrate. About 38% of the sample had a protein intake less than the 100% of the RDA for protein, 54% met the goal of limiting daily intake of salt to 2400 mg or less, and 21% consumed more than the 100% of the RDA for calcium. The goal of five or more servings of fruits and vegetables

Table 4. Comparison of nutrient Intakes as %RDA between elderly Korean and United States women aged 65 and older

	Korean (n = 100)	United States (n = 1049)
Energy	94.3 ± 25.8[1)]	73.6 ± 24.3[2)]**
Protein	107.2 ± 46.6	115.1 ± 42.2[NS]
Calcium	62.5 ± 33.1	73.9 ± 38.1*
Iron	88 ± 44.8	121.5 ± 58.6**
Vit A	48.2 ± 33.4	128.8 ± 137.4**
Thiamin	101.2 ± 64.3	123.9 ± 51.7**
Riboflavin	81.8 ± 35.2	126.6 ± 56.2**
Niacin	99.4 ± 51.3	132.9 ± 55.6**
Vit C	138 ± 95.1	153.4 ± 108.7[NS]

[1)] Mean ± SD as %RDA (Korean RDA) for elderly Korean women.
[2)] Mean ± SD as %RDA (US RDA) for elderly US women from CSFII CD Rom.
*Means are significantly different ($p < 0.05$) by t-test.
**Means are significantly different ($p < 0.0001$) by t-test.
NS: Means are not significantly different at $\alpha = 0.05$.

Table 5. Korean and American respondents whose diets met US dietary guidelines

Guideline	Korean		American	
	n	%	n	%
≤ 30% fat energy	90	90	439	41.8
≤ 10% sat. fat energy	98	98	493	47
≥ 50% carbohydrate energy	88	88	366	34.9
≤ 300 mg/day cholesterol	97	97	859	81.9
≤ 2400 mg/day sodium	8	8	567	54.1
≤ 100% RDA protein	52	52	403	38.4
≥ 100% RDA calcium	11	11	215	20.5
≥ 5 servings fruit & vegetable	57	57	399	38
Total	100		1049	

was met by 38% of the sample.

Evaluation of the Korean diet according to US guidelines indicated that 90% of the Korean sample consumed a diet consisting of less than 30% of energy from fat, 98% of the sample consumed less than 10% of energy from saturated fat, 97% consumed less than 300 mg/day cholesterol, 88% consumed a diet containing more than 50% of energy from carbohydrate, and 52% derived less than 100% of the Korean RDA for protein. Consumption of 5 servings of fruits and vegetables was met by 57% of the Korean sample. Although only 8% of Korean subjects consumed less than 2400 mg/day sodium, and only 11% consumed greater than 100% of the Korean RDA for calcium, most of the dietary consumption patterns of the Korean subjects showed more consistency with the US dietary guidelines than the dietary patterns of the American sample.

4. Diet quality index

In a previous evaluation of 1995 CSFII data,[13)] elderly women had the highest DQI scores of any age or gender group in the US population. This was in part due to the moderate consumption of fat, saturated fat, and cholesterol, and lower energy intake of elderly women compared to other age and gender groups. However, comparison of DQI scores between elderly Korean and US women indicate significantly higher scores for the Korean group than the American group. Mean DQI score of the elderly Korean women was 11.3 ± 1.4 out of 16 points, while the elderly American women had a mean DQI of 10.1 ± 2.9 points.

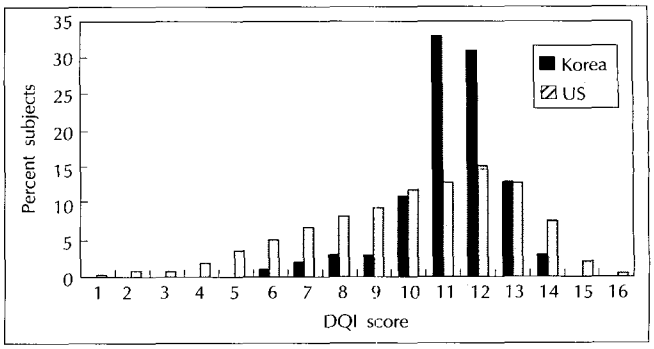

Fig. 2. Percent distribution of Diet Quality Index for elderly Korean and American women.

The percent distribution of diet quality index (DQI) for Korean and American women is shown in Fig. 2. Approximately 90% of Korean respondents scored between 10 and 13 points, while 53% of American subjects scored between 10 and 13 points. The percent distribution of dietary quality index (DQI) was more widely dispersed among the elderly US women than among the elderly Korean women.

DISCUSSION

Dietary intake assessments have traditionally focused on a single nutrient or on the nutrient composition of the diet rather than on the patterns of food selection. Food-based analyses of the total diet are currently assuming an increasingly prominent place in nutrition research.[4)9)] Assessment of diet quality based on human eating behavior represents a relatively new tool in nutritional epidemiology.

The Diet and Health recommendations[1)14)] provide an important standard for evaluating diets. Dietary indices developed from these guidelines have been verified and validated for a risk gradient predictive of chronic disease using the American 1987-88 Nationwide Food Consumption Survey (1987-88 NFCS) data.[4-11)] The methodology of measuring diet quality by an index based on US dietary guidelines has already been used to assess diet quality and dietary diversity of French adults.[32)33)]

In the present study we used a modified version of the DQI to evaluate the diet quality of a large and representative sample of elderly American women and a selected sample of aged Korean women. Good diet quality, as measured by the DQI tool, is associated with diets that are lower in fat, saturated fat, cholesterol, limited in sodium, moderate in protein, adequate in calcium, and a significant consumption of grain products, fruits and vegetables.[14][16]

The dietary habits and dietary consumption of Koreans are different from those of Americans. Furthermore, the Korean dietary guidelines[28] are different from the US guidelines, particularly in terms of fat consumption. Due to the typically low consumption of fat among Koreans, the Korean dietary guidelines recommend that Koreans consume 20% of total energy as fat. The mean percent of fat energy consumed by the elderly Korean in the present study was 19%: 58% of the subjects consumed diets with less than 20% of energy from fat, and 90% consumed less than 30% of energy from fat. In contrast, the elderly American women had a mean fat intake of 32% of energy. Only 7% consumed less than 20% of energy, while 42% consumed diets that derived less than 30% of energy from fat. These large differences in fat intake may limit the applicability of the American dietary standard based DQI tool to populations with significantly lower fat intakes, as in the case of the Korean population. Therefore, an appropriate instrument should be developed in the near future to measure the overall diet quality of the Korean diet. Furthermore, evaluating the quality of the Korean diet in relation to potential health outcomes is also a research topic of considerable interest.

Use of the DQI tool in the present study pointed out several differences between Korean and American diets. Our study shows that elderly Korean women had better diets by American standards than the elderly US women particularly in terms of consumption of fat, saturated fat and cholesterol. This observation was apparent, even though in previous studies[13][17] the elderly American diet was considered more healthy than diets of younger American women. The study of 1995 CSFII data indicated that among women aged 18 years and older,[13] only 35.9% consumed less than 30% energy from fat, 41.4% consumed less than 10% energy from saturated fat, and 78.9% consumed less than 300 mg cholesterol per day. Similarly, among women aged 19 to 50 years in the 1987-88 Nationwide Food Consumption Survey,[34] only 14.5% met the most important goal of keeping total fat intake to 30% less of energy, and only 13.7% met the recommendation to consume less than 10% of energy from saturated fat. Approximately 62.9% consumed less than 300 mg cholesterol per day [34].

Although only 8% of the elderly Korean women met the recommendation for sodium intake, and only 11% consumed more than Korean recommendation for calcium intake, the overall diet quality score was significantly higher for the elderly Korean women than for the elderly US women.

CONCLUSION

Diet and chronic disease research has been limited by the lack of appropriate methods to evaluate overall diet quality. The complex and multidimensional nature of the human diet poses a challenge to the investigator, especially when it comes to comparisons between countries. In this study, some existing methodologies were adapted to evaluate diet quality of a sample of elderly Korean women.

Although the Korean diet failed to meet some of the US dietary guidelines, the overall Korean diet is appreciably better than the US diet according to these same guidelines. Methodological factors and cultural biases may account for some of the observed differences between Korean and US data.

A diet quality index (DQI) for Korean people should be developed in accordance with the Korean dietary guidelines, after considering the epidemiological and clinical evidence that link dietary factors and chronic disease for Koreans. Moreover, other dietary indices reflecting different aspects of eating behavior need to be used in assessing the overall quality of eating habits. Indices of diet quality should offer a new approach to compare diet quality across nations, cultures and societies.

Epidemiological studies of diet and disease should consider measuring overall diet quality as an integrated measure of various dietary variables. Currently there are no estimates of the factors that may induce diet quality variability. Subsequently this should be an area for additional investigation. Verification and validation of various indices of overall diet quality against biochemical, anthropometric, and clinical parameters of nutritional status are also needed. Studies of diet quality indices are a promising new approach in the study of diet and associated health outcomes and may provide new insight into the Korean diet.

Literature cited

1) National Research Council. Committee on Diet and health, Food and Nutrition Board, Commission on Life Sciences. *Diet and Health: Implications for Reducing Chronic Disease Risk. Washington, DC*: National Academy of Sciences: 1989
2) Willett WC, Sacks F, Trichopoulou A, Drescher G, Ferro-Luzzi A, Helsing E, Trichopoulos D. Mediterranean diet pyramid: a cultural model for healthy eating. *Am J Clin Nutr* 61(suppl): 1402S-1406S, 1995
3) Rimm EB, Ellison RC. Alcohol in the mediterranean diet. *Am J Clin Nutr* 61(suppl): 1378S-1382S, 1995
4) Patterson RE, Haines PS, Popkin BM. Diet Quality Index: Capturing multidimensional behavior. *J Am Diet Assoc* 94: 57-64, 1994
5) Kant AK, Block G, Schatzkin A, Ziegler R, Nestle M. Dietary diversity in the US population, NHANES II, 1976-1980. *J Am Diet Assoc* 91: 1526-1531, 1991
6) Kant A, Schatzkin A, Block G, Ziegler R, Nestle M. Food group intake patterns and associated nutrient profiles of the US population. *J Am Diet Assoc* 91: 1532-1537, 1991
7) Kant AK. Indexes of overall diet quality: A review. *J Am Diet Assoc* 96: 785-791, 1996
8) Popkin BM, Siega-Riz AM, Haines PS. A comparison of dietary trends among racial and socioeconomic groups in the united states. *N Engl J Med* 335: 716-20, 1996
9) Kennedy ET, Ohls J, Carlson S, Fleming K. The healthy eating index: Design and applications. *J Am Diet Assoc* 95: 1103-1108, 1995
10) Block G. Dietary guidelines and the results of food consumption surveys. *Am J Clin Nutr* 53: 356S-356S, 1991
11) Guthrie HA, Scheer JC. Validity of a dietary score for assessing nutrient adequacy. *J Am Diet Assoc* 78: 240-245, 1981
12) Krebs-Smith SM, Smiciklas-Wright H, Guthrie HA, Krebs-Smith J. The effects of variety in food choices on dietary quality. *J Am Diet Assoc* 87: 897-903, 1987
13) Chung CE, Cho SS, Henderson SA, Drewnowski A. Measures of dietary diversity, variety and quality in the US:Analyses of the 1995 CSFII data set. *The FASEB Journal* Vol.12, No.5, 1998
14) *Nutrition and Your Health: Dietary Guidelines for Americans.* 4th ed. Washington, DC: US Deprts of Agriculture and Health and Human Services: 1995. Home and Garden Bulletion No. 232
15) *Healthy People 2000: National Health Promotion and Disease Prevention Objectives.* Washington, DC: US Dept of Health and Human Services: PHS publication 91-50212, 1991
16) *USDAs Food Guide Pyramid.* Washington, DC: US Depts of Agrculture and Health and Human Services: Home and Garden Bulletin No. 249, 1992
17) Kant AK, Schatzkin A, Harris TB, Ziegler RG, Block G. Dietary diversity and subsequent mortality in the First National Health and Nutrition Examination Survey Epidemiologic Follow-up Study. *Am J Clin Nutr* 57: 434-440, 1993
18) Kant AK, Schatzkin A, Ziegler RG. Dietary diversity and subsequent cause-specific mortality in the NHANES I Epidemiologic Follow-up Study. *J Am Coll Nutr* 14: 233-238, 1995
19) Kim JC, Shim JS, Yang YJ. Computerized nutrient data base system and the development of a nutritional analysis software program for Koreans. *Korean J Community Nutrition* 3(6): 841-849, 1998
20) Son SM, Park YJ, Koo JO, Kim SB, Lee KS, Yoon HY. Nutritional and health status of Korean elderly from low-income, urban area and improving effect of meal service on nutritional and health status. *Korean J Community Nutrition* 1(3): 395-404, 1996
21) Yim KS, Min YH, Lee TY. Strategies to improve nutrition in the elderly: an analysis of health related factors and the nutritional risk index of the elderly. *Korean J Community Nutrition* 2(3): 376-387, 1997
22) Park SY, Paik HY, Moon HK. A study on the food habit and dietary intake of preschool children. *Korean J Nutrition* 32(4): 419-429, 1999
23) Park SY, Paik HY, Yu CH, Lee JS, Moon HK, Lee SS, Shin SY, Han GJ. A study on the evaluation of food intake of people living in rural areas. *Korean J Nutrition* 32(3): 307-317, 1999
24) Han KH, Jung EH, Dho SJ. The effectiveness and preferences of nutritional supplementary drinks for the elderly. *Korean J Community Nutrition* 2(3): 366-375, 1997
25) Oh SY, Hong MH. Repeatability of a semi-quantitative food frequency questionnaire or the Korean elderly. *Korean J Nutrition* 31(7): 1183-1191, 1998
26) Paik HY, Ryu JY, Choi JS, Youn JA, Moon HK, Park YS, Lee HI, Kim YK. Developmnet and validation of food frequency questionnaire for dietary assessment of Korean adults in rural area. *Korean J Nutrition* 28(9): 914-922, 1995
27) Lee JW. Nutrition assessment tools and indices for nutrition screening. *Korean J Community Nutrition* 3(6): 873-880, 1998
28) Recommended Dietary Allowances for Koreans 6th Revision. The Korean Nutrition Society. 1995
29) Nutass (Ewha computer program for nutrients analysis), Ewha Womans University, 1997
30) Continuing Survey of Food Intakes by Individuals 1994-96 CD Rom, U.S. Department of Agriculture.
31) Statistical Analysis System, Version 6.12, SAS Institute Inc, 1996
32) Drewnowski A, Henderson SA, Shore AB, Fischler C, Preziosi P, Hercberg S. Diet quality and dietary diversity in France: Implications for the French paradox. *J Am Diet Assoc* 96: 663-669, 1996
33) Drewnowski A, Chung CE, Preziosi P, Hercberg S. Assessing the quality of the French Diet: The SUVI MAX study. *The FASEB Journal* Vol. 12, No.5, 1998
34) Thompson FE, Sowers MF, Frongillo EA, Parpia BJ. Sources of fiber and fat in diets of US women aged 19-50: implications for nutrition education and policy. *Am J Public Health* 82: 695-702, 1992