

An Ecological Study of the Health Status and Dietary Habits of Korean Women in Menopause

II. Nutritional Status, Dietary Habits and Food Preference of Korean Women in Menopause

更年期婦人の 건강狀態와 食生活에 關한 生態學的 研究

II. 更年期 女性の 건강, 營養攝取狀態, 食習慣 및 食品選擇構造에 關한 研究

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科學의 발전과 經濟의 高度成長으로 食生活의 向上은 人間의 수명을 크게 연장시키고 있다. 韓國에 있어서도 이러한 傾向은 같은 樣相이며 더우기 보건형태가 차차 변경되어 가고 있다.

女性の 平均수명은 男性보다 길며 近來에 이르러 女性人口의 95%가 閉經을 經驗할 때까지 生存하고 있다고 한다.

이러한 실정임에도 불구하고 우리나라 女性の 閉經年令, 更年期에 處한 婦人들의 건강 및 營養攝取狀態, 食生活 態度등에 關한 情報가 파악되어 있지 않고 있다.

本 研究는 이 點을 감안하여 우리나라의 中年女性の 건강管理의 指針을 세우기 위하여 생물학적 요인 및 환경적 요인이 閉經年令 및 更年期婦人の 건강狀態와 食行動에 어떠한 영향을 미치는지를 검토하여 보았다.

本 研究는 1980년 12월에서 1981년 2월까지 3개월간 韓國의 2個의 大都市와 5個의 小都市에 거주하는 40歲에서 60歲까지의 女性을 대상으로 설문지를 통해 다음과 같은 사항을 조사하였다.

조사내용으로 1) 폐경연령, 주거환경, 사회경제적 조건, 체위, 임신횟수, 유산경험의 유무 2) 건강상태, 갱년기 자각증상, 유경시 월경의 순, 불순상태 그리고 3) 영양섭취상태와 식행동 등이다.

本論文은 調査內容 中 第2報로 更年期女性の 영양섭취상태와 식생활 행동 그리고 更年期 현상과의 關係를 關例시켜 검토하였다.

간식식품 섭취 사항 조사표를 사용하여 영양소의 섭취상태를 조사한 결과 大都市群은 energy, 지방, thiamin 및 ascorbic acid의 섭취상태가 그 對照群에 비하여 높은 경향을 나타냈다.

열량 구성비에 대한 검토를 보면 糖質:蛋白質:脂肪(C:P:F)의 비가 64~67%:14%:19

~22%였으며 大都市群은 小都市群에 비해 脂肪에서의 energy 섭취가 유의적으로 높았다. 더우기 사회 경제적 측면으로 보아도 지방섭취는 저소득층에서 낮은 경향을 보여 주었다.

更年期女性の 음식에 대한 기호變化的 검토를 통해 관찰한 것에 의하면 閉經者가 未閉經者에 비해 더 많이 食品嗜好의 變化를 경험하고 있다고 지적되고 있다. 37.4%와 28.1%가 각기 기호의 變化를 경험하고 있었으며 이는 兩群間에 有意차가 높음을 보여주었다. 閉經率 3年頃부터 食品의 嗜好變化를 느끼고 있다고 하는 사람이 많았으며 음식은 기름이 있는 것보다 담백한 것, 肉類보다는 生鮮, 果實, 野菜를 더 선호하는 경향이라고 하였다. 자극성이 있는 것에서 덜 자극성 있는 것을 찾는 경향이였다.

이들의 食品선택구조를 파악하는 것은 그 지역의 특수한 영양문제뿐만 아니라 그들의 영양교육, 더 나아가서는 그 지역의 식량영양정책 수립을 위해 중요한 정보를 제공할 수 있다.

大都市群은 肉類, 卵類, 乳類 및 그 製品등의 선택과 빵이나 butter 등의 食品과 正의 相關性을 나타내고 있었으나($p < 0.01$) 김치와 같은 韓國의 傳統의 食品의 선택時는 乳類, 果實, 빵과 같은 近代의 感覺의 食品과는 負의 相關性을 나타냈다. 한편 김치는 밥 및 기타 곡류 그리고 서류와는 正의 相關性을 시사하였다. 小都市群은 對照群과는 多少 상이한 食品선택 구조를 보이고 있다. 즉 卵類나 乳類를 섭취할 수 있는 사회경제적 조건, 그리고 기호를 갖는 사람들은 서류를 제외한 모든 식품과 正의 相關性을 나타냈다.

어느 群이든 밥과 김치는 높은 相關性을 나타내고 있으며, 이 두 식품은 韓國人의 食生活의 基本이 되고 있으며 이를 土臺로 다른 食品의 선택은 地域的, 社會經濟的, 그리고 個人의 기호에 따라 다르게 나타난다는 것이 시사되었다. 閉經前後의 更年期라는 것은 30餘年間의 性 hormone의 周期的分泌에 依한 月周期가 停止하는 時期이며, 內分泌環境의 變化에 依한 生體 리듬의 異常은 各種 更年期증상의 원인이 되고 있다. 有經時의 月經주기의 이상을 경험하는 사람에게 특히 更年期증상中 食慾不振이나 不眠 등의 不平等數가 많았다. 이러한 점으로 미루어 보아 estrogen과 食慾과의 相關性이 높음이 시사되었다. 이는 不眠症과는 연관성이 있으며 性호르몬 分泌의 亂脈은 食事攝取의 리듬을 흐들어 놓으며 이것이 生體리듬의 變化를 유발한다고 본다.

I. Introduction

Rapid development of science and technology in recent years has resulted in the lengthening of the life span of human beings; life span of women is longer than that of men^{1,2}. Statistics of the Korea Economic Planning Board for 1980 showed that the average life expectancy of Korean women at birth was 69.1 years, while that of men was 62.7 years³.

Improved nutrition accompanying recent economic development of Korea has led to improved health, and this, in turn, has resulted in the lengthening of life: Although industrialization brought with it a more ade-

quate life and a richer diet, this was accompanied by a lack of knowledge of good nutrition and poorly developed dietary habits, resulting in obesity in women of middle and old age. This, in turn, has led to chronic degenerative disease and has contributed to a variety of health problems.

Menopause occurs in the middle years of a women's life. It is the time when various aspects of life reach fruition. Women in the menopausal stage of life are an essential part of society and since their influence on the family and society is great, they are essential to the development of a healthy nation. There is, therefore, a great need to study the living environment, dietary habits, and nutritional

status of this portion of the population.

During a period of about 40 years, from the end of the Second World War in 1945 to the present, over 160 studies dealing with the nutritional status of Koreans have been carried out. Most of these have investigated the nutrition of the general population, growing children, and school age children. Only a few (5 or 6) studies dealt with the nutritional status of athletes and soldiers. In addition, with the increasing number of the elderly in the population, there has been an increase in concern about the nutritional problems of the aged; since 1970, some studies have been done in Korea on the nutritional status of the elderly with efforts being made to solve their problems. However, no studies have been done in Korea regarding the nutritional status of women of middle age. Particularly, there have been no nutritional studies on women in the menopausal stage of life although they account for half the population of the middle age group. Improved nutritional status and suitable living environments tend to lengthen the fertility period and life expectancy and also diminish negative symptoms of the climacteric, providing all around better health. For this reason, it is important to study the nutritional status of Korean women in menopause.

The purpose of this study was to investigate the relationship of nutrition, food selection patterns and food habits of middle-aged Korean women.

II. Method

1. Sample

The subjects of this study were middle aged Korean women between 40 and 60 years of age. The sample was divided into 2 sub-groups according to residence in the 2 largest cities

(metropolitan location) or in one of 5 towns. The metropolitan sub-sample consisted of 1,450 women and the town sub-sample was composed of 500 women. Altogether, there were 1,950 subjects.

2. Instruments

This study was conducted with the use of a questionnaire for middle aged women. The questionnaire was mailed to the subjects and responses received during December 1980 through February 1981. The criteria for selection of the sample was ability to understand the questionnaire without assistance. There were 1,145 respondents from the metropolitan area and 402 respondents from 5 towns of which 791(54.6%) from the metropolitan locations and 371(74.2%) from the town locations were usable. Thus, a total of 1,162(60%) completed questionnaires were available for statistical analysis.

The content of questionnaire was a check list designed to measure changes in food habits during menopause. Food intake was determined with the use of the 24-hour dietary recall method.

3. Data Analysis

The data were analyzed by the SPSS computer program package⁴⁾. The mean and standard error were computed for dependent and independent variables and significance was tested with the t-test, F-test and X^2 . The correlation matrix of food intake behavior was analysed by factor analysis and a geographical comparison was carried out.

III. Results

1. Dietary intake of energy and nutrients in middle aged women in menopause

The daily food intake of middle aged women

Table 1. Nutrient Intake of Middle Aged Women in Korea Compared by Two Locations

Area Nutrient Intake	Metropolitan			Town			t	df	Prob.
	Mean Value	SE	Percent R.D.A.	Mean Value	SE	Percent R.D.A.			
Energy(Kcal)	1836	13.04	102	1790	21.09	99.4	2.05	610.93	0.0410
Protein(gm)	66	0.58	94.3	64	0.92	91.4	1.94	653.99	0.0530
Fat(gm)	44	0.51	—	38	0.84	—	6.34	1117.63	0.0001
Carbohydrate(gm)	294	2.42	—	298	4.19	—	-1.05	621.40	0.294
Calcium(mg)	737	4.89	122.8	740	7.23	123.3	-0.33	1059	0.745
Iron(mg)	11.8	0.10	118.0	11.1	0.16	111.0	0.73	1051	0.467
VitaminA(RE)	650	40.00	108.3	630	61.00	105.0	1.72	1159	0.085
Thiamin(mg)	1.20	0.01	120.0	1.23	0.01	123.0	-2.32	606.24	0.018
Riboflavin(mg)	1.30	0.01	118.2	1.30	0.1	118.2	0.27	1156	0.787
Niacin(mg)	17.3	0.11	144.2	17.5	0.20	145.8	-1.65	577.60	0.099
Ascorbic Acid(mg)	61.4	0.58	122.8	57.2	0.79	114.4	4.20	1145	0.0001

in menopause was investigated by the 24-hour dietary recall method. The results are summarized in Table 1. The level of nutrient intake was compared by location and evaluated with the Korean Recommended Dietary Allowance (RDA)⁵⁾ for the purpose of assessing dietary adequacy, individual variability, and fit with the RDA guidelines.

The energy intake of metropolitan subjects met the RDA (102%), but the town subjects were a little below the RDA (99.4%). Except for protein, the intake of all nutrients was higher than that of RDA for all subjects. Among nutrients which were up to or over the RDA standard, differences in the intake levels between metropolitan and town subjects were not significant for carbohydrates, calcium, iron, vitamin A, riboflavin, and niacin.

A highly significant difference was found between locations on intake of thiamin and ascorbic acid ($p=0.018$ and $p=0.0001$, respectively), with town subjects showing a lower intake of these nutrients (see Table 1). A significant difference was also found for intake of protein ($p=0.053$) and for energy ($p=0.041$).

Town subjects were also lower on these nutrients.

A comparison was made of the energy construction of carbohydrate, protein, and fat intake by location. Fat intake was higher in metropolitan residents than town residents. This difference between the metropolitan and town locations was statistically significant ($p=0.0001$), with 21.6% and 19.1% of and 19.1% of total energy intake respectively. Consequently, the results showed the town residents to be higher in carbohydrate intake than their metropolitan counterparts (see Table 2).

2. Dietary habits and Food Preferences of Korean Women in Menopause

It has been reported that both men and women over 40 years of age experience a decrease in taste sensitivity⁶⁾. For women, it is reasonable to suppose that food habits might be affected by menopause which interrupts the biorhythm of the monthly menstrual period. The pre-menopausal subjects of this study were asked to record any changes in

Table 2. Area Comparison of Energy Construction (Unit: Percent)

Nutrients	Metropolitan		Town		t	df	Prob.
	Mean	SE	Mean	SE			
Protein(%)	14.4	0.059	14.3	0.085	40	1109	0.689
Fat(%)	21.6	0.180	19.1	0.299	6.93	618.08	0.0001
Carbohydrate(%)	64.0	0.222	66.6	0.359	-5.82	629.75	0.0001

Table 3. Changes in Food Preference by Location

Post-Menopause	Metropolitan		Town	
	Number	Percent	Number	Percent
Within First Year	27	18.5	24	33.8
Within Second Year	29	19.9	14	19.7
Three or More Years	90	61.6	33	46.5
Total	146	100.0	71	100.0

$\chi^2=6.068, df=2, p<0.05$

food preference in the past 3 years, and post-menopausal women were asked to record any change within 3 years after menopause. These changes were analyzed separately for pre-and post-menopausal subjects. Those who indicated a change in food preference in the past 3 years were 28.1 percent for the pre-menopausal group and 37.4 percent for the post-menopausal group. This difference was statistically significant ($p<0.01$). The post-menopausal group clearly indicated many more changes in food preference than their pre-menopausal counterparts. In order to determine the relationship statistically, post-menopausal subjects were asked to indicate whether change in food preference took place during 1) the first year, 2) between the first and second years, or 3) during the 3rd year and/or more than 3 years after menopause.

Analysis of food preference changes of metropolitan and town samples in category 3 (during the 3rd year and/or after the 3rd year following menopause) revealed a signi-

ficant difference between the respondents of these 2 locations, with 61.6 percent of metropolitan subjects and 46.5 percent of town subjects experiencing food preference changes at this time (see Table 3).

While it is seen that the food preferences of middle-aged women changed with menopause, a remaining question concerns the actual food preference of pre-and post-menopausal subjects. Increased preference for certain foods and flavors is reported in Table 4. It can be seen that both groups reported an increased preference for fruits and vegetable, and a higher percentage in both groups reported an increased preference for bland foods compared with saltier and peppery foods. The actual amount of change in preference for fruits and vegetables and for milder flavors and bland foods was greater for the pre-menopausal subjects than for post-menopausal subjects.

Further analysis of food preference was made on the basis of age group (40~49; 50~59; and 60~69) by location, and by pre- and

Table 4. Increased Preference¹⁾ for Certain Foods and Flavors Compared by Pre- and Post-Menopausal Groups

Foods and Flavors	Post-Menopause		Pre-Menopause		X ²	Prob.
	Number	Percent	Number	Percent		
Fatty Meat	55	9.5	64	22.7	26.40	0.00001
White Meat Fish	67	11.6	68	24.1	21.40	0.00001
Fruits & Vegetables	103	17.8	123	43.6	63.54	0.00001
Rice	40	6.9	43	15.2	14.06	0.0002
Milder Flavors	84	14.6	108	38.3	60.15	0.0001
Rich Foods	32	5.5	39	13.8	16.06	0.0001
Saltier Foods	23	4.0	30	10.6	13.35	0.0003
Bland Foods	70	12.1	80	28.4	33.53	0.0001
Sweeter Foods	49	8.5	56	19.9	21.76	0.0001
Peppery Foods	31	5.4	55	19.5	40.42	0.0001

1) Within 3 years

Table 5. Food Intake Behavior in Pre-and Post-Menopause

Food Group	Post-Menopause		Pre-Menopause		t	df	Prob.
	\bar{X}	SE	\bar{X}	SE			
Meat, Fish	2.49	0.046	2.56	0.047	-1.12	1160.00	0.264
Eggs	0.60	0.019	0.60	0.017	-0.10	1143.00	0.924
Milk	0.46	0.019	0.48	0.017	-0.19	1135.08	0.370
Milk Products	0.31	0.022	0.29	0.020	0.46	1144.63	0.648
Fruit	1.06	0.028	0.96	0.006	2.71	1160.00	0.007
Vegetables	0.96	0.016	0.98	0.013	-1.06	1146.46	0.288
Kimchi ¹⁾	0.97	0.016	0.99	0.014	-1.04	1136.20	0.300
Cereals	6.89	0.124	6.84	0.084	0.35	1017.09	0.724
Bread and Butter	0.13	0.011	0.16	0.012	-1.88	1153.46	0.060
Bread and Jam	0.14	0.012	0.18	0.014	-2.43	1143.86	0.015
Potatoes	0.44	0.015	0.42	0.012	-1.01	1121.04	0.314
Candy	0.50	0.015	0.51	0.011	-0.36	1044.33	0.717
Sweetened Beverage	0.56	0.015	0.53	0.009	2.10	942.32	0.036
Carbonated Beverage	0.43	0.016	0.42	0.011	0.78	1023.26	0.436
Cake	0.44	0.016	0.46	0.010	-1.19	983.10	0.236
Fat & Oils	0.75	0.018	0.72	0.013	1.25	1135.34	0.211

 \bar{X} : Mean Number of Servings SE: Standard Error

1): Fermented Pickles

post-menopausal status. There were differences between groups in each category, but in the premenopausal population, metropolitan and town women who indicated an increased prefer-

ence for fruits and vegetables were 40.9 percent -55.3 percent and 37.1 percent -44.4 percent respectively. There were, however, no significant age differences. Also, the post-menopau-

Table 6. Correlation Coefficient of Food Intake of Middle Aged Women in the Metropolitan Population

Food Group	Meat Group	Eggs	Milk	Milk Product	Fruits	Vegetable	Kimchi	Rice & Other Cereals	Bread and Butter	Bread and Jam	Potato	Sugar & Candy	Carbonated Beverage	Cake & Oil
Meat Group	1.000													
Eggs	0.204*	1.000												
Milk	0.189*	0.295*	1.000											
Milk Products	0.155*	0.140*	0.261*	1.000										
Fruit	0.229*	0.242*	0.192*	0.145*	1.000									
Vegetables	0.127*	0.035	0.037	0.055	0.028	1.000								
Kimchi	0.014	-0.084	-0.103*	-0.090	-0.093*	0.363*	1.000							
Rice & Other Cereals	-0.031	-0.098*	-0.048	-0.033	-0.042	0.091	0.126*	1.000						
Bread and Butter	0.049	0.090	0.156*	0.131*	0.076	-0.036	-0.188*	-0.064	1.000					
Bread and Jam	0.069	0.138*	0.078	0.112*	0.079	-0.006	-0.109*	-0.056	0.378*	1.000				
Potato	0.069	0.063	0.039	0.003	0.021	0.087	0.128*	0.009	0.003	0.074	1.000			
Sugar & Candy	0.073	0.032	0.047	-0.001	0.019	0.013	0.024	0.001	0.080	0.073	0.306*	1.000		
Beverages	0.030	0.032	0.007	-0.012	-0.027	-0.001	-0.017	0.019	0.016	0.022	0.406*	-0.471*	1.000	
Carbonated Beverages	0.090	0.118*	0.145	0.112*	0.176*	-0.030	-0.049	-0.009	0.010	0.076	0.329*	-0.390*	0.443*	1.000
Cake	0.072	0.015	0.108*	0.040	0.047	-0.053	-0.056	0.010	0.075	0.024	0.287*	-0.334*	0.454*	0.373*
Fats & Oils	0.084	0.077	0.077	0.117*	0.073	0.112*	-0.023	0.045	0.028	0.008	0.268*	-0.276*	0.342*	0.282*

df = 791,

t = 2.57,

* : p = 0.01

1) Fermented Pickles

Table 7. Correlation Coefficient of Food Intake of Middle Aged Women in the Town Population

Food Group	Meat Group	Eggs	Milk	Milk Product	Fruits	Vegetable	Kimchi	Rice & Bread Other and Cereals	Bread and Butter	Potato	Sugar & Candy	Bev-erage	Carbo-nated Bev-erage	Cake & Oil	Fat & Oil	
Meat Group	1.000															
Eggs	0.312*	1.000														
Milk	0.318*	0.555*	1.000													
Milk Products	0.242*	0.407*	0.467*	1.000												
Fruit	0.309*	0.259*	0.207*	0.226*	1.000											
Vegetables	0.146*	0.203*	0.201*	0.248*	0.006	1.000										
Kimchi	-0.003	0.204*	0.108	0.224*	-0.202*	0.625*	1.000									
Rice & Other Cereals	0.082	0.374*	0.312*	0.303*	-0.068	0.469*	0.484*	1.000								
Bread and Butter	0.135*	0.218*	0.206*	0.203*	0.244*	-0.056	-0.070	-0.034	1.000							
Bread and Jam	0.098	0.142*	0.107	0.105	0.205*	-0.040	-0.061	-0.075	0.361*	1.000						
Potato	-0.072	-0.109	-0.186*	-0.084	-0.059	0.094	0.167*	0.080	0.023	0.003	1.000					
Sugar & Candy	0.123	0.483*	0.429*	0.391*	0.016	0.337*	0.310*	0.506*	0.102	0.020	-0.077	1.000				
Beverages	0.160*	0.513*	0.474*	0.416*	0.070	0.315*	0.337*	0.498*	0.062	0.093	-0.192*	0.613*	1.000			
Carbonated Beverages	0.095	0.457*	0.459*	0.411*	0.047	0.308*	0.350*	0.463*	0.077	0.019	-0.050	0.484*	0.549*	1.000		
Cake	0.150*	0.453*	0.401*	0.419*	0.088	0.369*	0.413*	0.555*	0.025	0.079	-0.046	0.492*	0.529*	0.516*	1.000	
Fats & Oils	0.240*	0.499*	0.473*	0.314*	0.163*	0.267*	0.246*	0.468*	0.114	0.070	-0.084	0.531*	0.550*	0.371*	0.497*	1.000

df=371,

t=2.57,

*: p=0.01

1) Fermented Pickles

sal groups in both locations exhibited an increased preference for mildly flavored foods (metropolitan: 10.4-17.7 percent; town: 14.7-26.3 percent).

Changes in food preference among age groups showed no statistical significance ($p > 0.05$). It could thus be assumed that change in food preference and food habits in menopause was related more to the disturbance of the biorhythm than the aging phenomena.

Food consumption within the past 24 hours was converted into numerical scores and compared by pre- and post-menopausal status. The results of this analysis are seen in Table 5. Post-menopausal subjects varied significantly from pre-menopausal subjects. The greatest differences were in intake of fruit, bread, and beverages. The post-menopausal group exhibited a significantly higher intake of fruit while the pre-menopausal group exhibited a significantly higher consumption of bread.

In a comparison of food intake behavior by location and socio-economic group, the average intake of foods in the meat group, milk and milk products group, and fat and oil group showed a significantly positive increase with higher socio-economic status in both locations. However, intake of vegetables, cereals, and potatoes showed an inverse relationship to socio-economic status. That is, the lower socio-economic groups had a higher intake of the vegetables, cereals and potato groups. These tendencies were more pronounced for metropolitan than for town subjects.

3. Numerical Analysis of Food Selection Patterns of Middle Aged Korean Women in Menopause

A correlation matrix and factor analysis was computed to determine the food consumption structure based on the food selection of

the subjects in each of the 2 locations. The selected foods were classified into 16 food groups and their interrelationships were determined. The resulting correlation matrices are reported in Tables 6 and 7.

The food consumption structure of metropolitan subjects (see Table 6) shows that the intake of meat was positively related to the intake of eggs, milk and milk products, fruits, and vegetables ($p < 0.01$). The intake of eggs showed a negative relationship with the intake of rice and other cereals. *Kimchi* and rice and other cereals showed a positive relationship with to each other. *kimchi* was also positively related to potatoes but negatively related to bread. The intake of potatoes was positively related to sweet foods and fat and oils. Meat, eggs, milk and milk products were definitely preferred by metropolitan middle aged women (see Table 6) and showed a strong positive interrelationship. Traditional Korean foods such as *kimchi* were negatively correlated with milk, fruit, and bread. Also, rice and other cereals, and potatoes which showed a positive relationship with *kimchi* indicates a higher carbohydrate consumption.

The food consumption structure of town subjects is shown in Table 7, where the meat group had a significant, positive relationship with eggs, milk and milk products, fruit, and vegetables, cakes, bread and butter, beverages, and fat and oils ($p < 0.01$). Except for eggs, and milk and milk products, most of the other food groups were positively correlated for the town subjects. The intake of meat, eggs, and milk and milk products had a negative correlation with the intake of potatoes. Potatoes had a significant positive correlation only with beverages and *kimchi* in the town population. In this way, the town subjects were somewhat different from their metropolitan counterparts

Table 8. Correlation Coefficient of Traditional and Modern Foods by Location

Food Group	Kimchi		Bread and Butter		Rice		Meat			
	Metro-politan	Town	Metro-politan	Town	Metro-politan	Town	Metro-politan	Town		
↑ Traditional	Kimchi ¹⁾	1.000	1.000	-0.188*	-0.070	0.126*	0.484*	-0.014	-0.003	
	Rice and Other Cereals	0.126*	0.484*	-0.064	-0.034	1.000	1.000	-0.031	0.082	
	Vegetables	0.363*	0.625*	-0.036	-0.056	0.037	0.468*	0.127*	0.146*	
	Potatoes	0.128*	0.167*	0.003	0.023	0.009	0.080	0.069	-0.072	
	Sugar and Candy	0.024	0.310*	0.080	0.102	0.001	0.506*	0.073	0.123	
	Cake	-0.056	0.413*	0.075	0.025	0.010	0.555*	0.072	0.095	
	Eggs	-0.084	0.204*	0.090	0.218*	-0.098*	0.374*	0.204*	0.312*	
	Fruits	-0.093	-0.202*	0.076	0.244*	-0.042	-0.068	0.229*	0.309*	
	Beverage	-0.017	0.625*	0.016	0.062	0.019	0.498*	0.030	0.160*	
	Carbonated Beverages	-0.049	0.350*	0.010	0.077	0.009	0.463*	0.090	0.095	
	Fats and Oils	-0.023	0.246*	0.028	0.114	0.045	0.468*	0.084	0.240*	
	Meat	0.014	-0.003	0.049	0.135	-0.031	0.082	1.000	1.000	
	Bread and Butter	-0.188*	-0.070	1.000	1.000	-0.064	-0.034	0.049	0.135*	
	↓ Modern	Bread and Jam	-0.109*	-0.061	0.378*	0.361*	-0.056	-0.075	0.069	0.098
		Milk	-0.090	0.108	0.156*	0.206*	-0.048	0.312*	0.190*	0.318*
Milk Products		-0.093	0.224*	0.131*	0.203*	-0.033	0.303*	0.155*	0.242*	

df=791 for Metropolitan Area

t=<2.57

1): Fermented Pickel

df=371 for Town Area

*;p<0.01

in their food intake patterns.

In both locations the intake of fruits and bread were positively correlated with each other, but they were negatively correlated with *kimchi* intake. Furthermore, rice and meat did not show any particular relationship to each other in both location. In both locations, sugars, sweetened beverages, carbonated beverages, cakes and fat intakes were positively correlated with each other ($p<0.01$).

Food consumption was further analyzed to determine relationships between such traditional foods as *kimchi* and rice and modern foods such as bread and meat. The correlations are summarized in Table 8. In both locations *kimchi* had a strong relationship with such traditional foods as rice, vegetables, and potatoes,

while the metropolitan subjects exhibited a negative relationship of *kimchi* to bread, and in the town subjects, a negative relationship to fruit. At the same time meat, bread, and milk showed no relationship to *kimchi* at all.

The intake of bread in both populations had a strong correlation with the consumption of milk and milk products, while it had a significant negative relationship to intake of *kimchi* in the metropolitan population. This indicates that selection of bread is negatively related to the intake of traditional foods. The intake of rice was compared with meat for analysis of the structure of food selection patterns and it was found that while the choice of rice and other grains had a strong correlation with *kimchi*, there was no relationship at

all between rice and meat and between rice and bread.

In both locations, the intake of the meat group showed a positive correlation with the intake of vegetables, fruit, eggs, milk and milk products. The structure of the food choice of metropolitan middle aged women shows strong correlations between *kimchi*, rice and other traditional foods and a negative correlation ($p < 0.01$) or no correlation between such modern foods as bread, and milk. Town middle aged women showed a positively correlated preference for *kimchi* and rice, a pattern that was similar to that of metropolitan subjects. The intake of *kimchi* was negatively correlated with a preference for fruit. The foods with no correlation with *kimchi* were meat, bread, and milk.

IV. Discussion and Conclusion

Since 1970, surveys on the nutritional status of elderly women have been plentiful and a great deal attention has been given to this subject by scholars around the world⁷⁻¹⁰. However, studies on the nutritional status of the climacteric in women have been almost nonexistent. Therefore, very little work has been done on the relationship between the climacteric and the nutritional intake of menopausal women.

In the last 30 years, from the 1940's to the 1970's the total daily energy intake of Koreans varied greatly from location to location. During these three decades, the daily energy intake of a Korean adult was in the range of 2,300~2,500 kilo calorie. This was less than the 2,700 kilo calorie, Recommended Dietary Allowance (RDA) for a Korean adult⁹. In short, this means that at that time the energy intake of a Korean adult was only 85.2 to 92.5 percent

of the RDA^{10,11}. As seen in Table 1, the energy intake of middle aged Korean women in menopause met the Recommended Dietary Allowance. However, metropolitan subjects showed a higher energy intake than town subjects. These values were statistically significant ($p = 0.041$).

A pressing nutritional problem of Koreans has been the low intake of fat. Even up to the 1960's the energy gained from fatty foods had only been 10 percent of total energy. However, other than the lack of vitamin A, riboflavin, and iron the intake of other nutrients has been within the limits set by the RDA^{10,11}.

This study found that the nutritional status of Korean women of 40 years of age was adequate in intake of nutrition except for protein and iron. Thus, total make-up of nutrition has improved greatly. According to a study conducted in 1970 on Korea's nutritional status, the ratio of energy composition carbohydrate: protein:fat(C:P:F) had been 80~85 percent: 10~11.5 percent: 5~8 percent¹⁰⁻¹². The CPF ratio of this study came close to the Japanese data of 66.6 percent: 12.5 percent: 20.9 percent¹³. In the present study, the carbohydrate intake decreased as the consumption of fat increased thereby showing a balanced dietetic life. However, as was shown in the CPF ratio, the percentage of fat and carbohydrate in the total energy intake still differed from location to location.

Physical symptoms such as osteoporosis and backache is frequently observed among menopausal women. Such climacteric symptoms may very well be related to the lack of vitamin A and calcium. In this study, the intake of iron, calcium and vitamin A met the RDA, and there was no significant difference in the metropolitan and town locations in terms of quantity of intake. However, when the nutritional

source was animal rather than plant, there was bound to be a difference in the utilization of nutrients within the body. The town respondents showed a higher dependence on plant sources than the metropolitan respondents. The intake of energy, fat and protein differed according to income level, and the same trend was shown in both metropolitan and town locations. In both locations the intake of energy did not reach the RDA among the low income respondents, and also the intake of protein did not meet the RDA except in the town high income group. Fat intake was more significantly affected by income level; the lower the income among the town respondents the lower the intake of fat.

Although nutritional intake showed significant differences by income and location, the CPF ratio of energy construction in this study was 64.0~66.6 percent: 14.3~14.4 percent: 19.1~21.6 percent. Lee et al¹⁴⁾ in their study of 1980 suggested that the ideal CPF ratio is carbohydrate 70 percent, protein 15~16 percent and fat 15~16 percent. In this respect, the dietetic pattern found in the present study was satisfactory, showing a much improved caloric construction over that reported by Lee in 1971¹⁵⁾.

1. Changes in Dietary Habits and Food Preference of Korean Women in Menopause

Food habits are an aspect of culture in which personal, social, and situational factors interplay. Previously formed food habits might be influenced by many factors. In a study on the changes in food habits among Chinese immigrants in the U.S., it was found that their new environment provided exposure to new foods with consequent adoption of many of them¹⁶⁾. However, there was little change in

the selection of their traditional foods, such as rice and vegetables. Eauly¹⁷⁾ stated that change in food habits occurs slowly and gradually. She pointed out that the main cause of changing food habits of the family was brought about by the husband of other origin and by children who participate in the school lunch programs.

Although dietary habit is influenced by environmental factors, it is also affected by physiological changes caused by the aging process and menopause in women. The sensitivity of the olfactory threshold, for instance tends to decrease with aging¹⁸⁾. The dietary habits and food preferences of people above 60 years of age is known to change. As one grows older, one prefers foods that are mild, bland and sweet in taste, and tender in texture^{7,8)}. Hagihara stated that menopause is accompanied by changes in food habits and preference in middle-aged and elderly women¹⁹⁾.

More subjects in the post-menopausal group reported dietary change than those in the pre-menopausal group. They reported that dietary change came about approximately three years after menopause. This finding supports the opinion that dietary change and food preference are effected gradually. These results are similar to those reported by Hagihara¹⁹⁾. She pointed out that climacteric symptoms are accompanied by change in food preference. This was especially related to irregularity of menstruation during the pre-menopausal period.

In regard to the style of meals, the menopausal group definitely preferred Korean foods. However, when the post-menopausal group was compared with the pre-menopausal group on actual food intake it was found that the post-menopausal group preferred mild or bland foods, fruits, and sweets more than the pre-

menopausal group.

In order to prevent climacterically related disease such as arthereoclerosis, high blood pressure, osteoporosis, and obesity it has been recommended that the middle-aged and elderly should have proper energy intake, exercise, mental relaxation, and less salty food. This study found that the post-menopausal group preferred fruits, vegetables, lean meat, and mildly flavored food rather than salty and spicy foods. These findings can be interpreted by Hagihara's¹⁹⁾ research. She found that dietary change and change of food preference were related to the physiological change of menopause rather than to the aging process. Thus, it is important to have proper nutrition during the menopausal period and to give proper nutritional education.

2. Numerical Analysis of the Food Selection Patterns of Middle-Aged Korean Women in Menopause

In order to study the dietary life of a group of people two methods are usually applied. One is the study of cultural foods and nutritional research, and the other is the analysis of actual food intake using the numerical analysis method. It is important to understand the structure of food consumption because it contributes to the understanding of nutritional problems of particular locations. It also provides information which is valuable not only in the establishment of a constructive foods and nutrition policy but also is of value in nutrition education practice.

Recently, the application of computer science has advanced greatly, and it has become more feasible to treat survey data statistically. This study attempted to analyze the structure of the food consumption of middle-aged Korean women of metropolitan and town locations by

using computer science to carry out calculation of the correlation coefficient of amount of food intake.

This study observed that middle-aged women were inclined to prefer fruits and vegetables, milk or bland food, and sweet foods, and also they preferred their accustomed diet and native food rather than foreign food.

The salient feature of the food intake behavior of middle-aged women residing in metropolitan locations was a positive relationship between the selection of meat, eggs, and dairy products and the selection of bread. The respondents who consumed a great quantity of such typical Korean food as pickled *kimchi* showed a negative relationship with the intake of milk, fruit, and bread. However, there was a positive relationship between *kimchi* and rice, other cereals, and potatoes. This suggests that the intake of *kimchi* caused the increase of carbohydrate consumption.

The structure of food consumption of town residents showed that the meat group had a positive relationship with all food groups except *kimchi*, rice other cereals, and potatoes. The intake of fruit was lower than that of their metropolitan counterparts. There was a negative relationship between the *kimchi* and meat groups. Findings in Japanese dietary studies²⁰⁾, indicate their traditional dietary pattern is changing whereas, in Korea traditional rice and *kimchi* remain the basic diet regardless of location. Despite this, the selection of food varied according to location of residence and income level. For instance, in the metropolitan locations, milk became part of the daily diet, but in towns, milk and other dairy products were still considered a snack food.

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