

## Nutrient Intakes and Self-Perceived Health Status of the Institutionalized Elderly in Daejeon and Chungchong Area

Young-Jin Chung<sup>§</sup>

*Department of Food and Nutrition, Chungnam National University, Daejeon, Korea*

### ABSTRACT

This study was conducted to provide insight into the management and care of the elderly in nursing homes. Eighty-six elderly subjects over 65 years old (38 male, 48 female) in 3 non-fee-paying nursing homes, located in Daejeon and Chungchong areas, were studied. Subjects' dietary intakes by estimated food intake records, and self-perceived health conditions, were studied using questionnaires from July 21 to August 1, 1997. Twenty-one % of the male subjects and 42% of the female subjects were over 80 years. Their predominant past occupation was farming. While 8.3% of the female and no male residents showed a BMI (Body Mass Index) of 27 and above, about 30% of the subjects were underweight and in poor health status in seeing, joint pains, lumbago and shoulder pains. Regarding overall health status, 72.1% of the subjects considered them to be in poor health, and female and male subjects suffered more difficulties from cloudy eyes, joint pains and lumbago and shoulder pains than any other. Neuralgia was the predominant chronic complaint and followed by hypertension in both sexes. Overall, female subjects felt worse off than the male subjects in terms of their health status, that can be attributed to higher average age of the female subjects compared to the male subjects. The elderly were eating a very low fat (about 15 g: 6% of total calorie) diet with low vitamin A and E. Intakes of calories, protein and iron slightly exceeded RDA. The phosphorus intake was more than double the RDA although calcium intake was close to the RDA. From these results, it seems important to doubling the fat intake of the elderly residents in the form of vegetable fat with the object of raising the intake of vitamin E, antioxidant vitamin, and essential fatty acids for the elderly. It is also recommended that the elderly residents should be given adequate calcium and exercise for bone health.

**KEY WORDS:** institutionalized elderly, nutrient intake, self-perceived health status.

### INTRODUCTION

In recent years, life expectancy has been increasing in Korea due to improvements in the national economy, the national medical insurance system, and nutritional status and living conditions, and expanded medical facilities. The percentage of the population over the age of 65 years was only 2.9% in 1960, and has increased to more than 7% in the year 2000, placing Korea in "an aging society" category by the definition of the United Nations (UN). In 2020, Korea will become an aged society, and in 2050, more than one third of the population (34.4%) is expected to be over the age of 65 years.<sup>1)</sup> The problem of caring for the elderly is becoming a social problem in Korea, because the changes in family structure, and in industrialization and urbanization, create a geographical separation of the elderly from their children. The trend of women taking jobs outside the home is making caring for the elderly by the family even more difficult. Thus, there is an increasing trend for the elderly to enter nurs-

ing homes.<sup>2)</sup> However, a social welfare system such as income protection for the elderly is not established in Korea: the number and quality of elderly care facilities, to replace or compensate for the loss of the individual family's ability to care for the elderly, is lagging behind the demand.

Facilities for caring for the elderly are nursing homes and convalescent homes, and they can be classified into non-fee-paying, non-profit, or fee-paying institutions. Non-fee-paying and non-profit facilities are supported by the national and/or local governments, or by private contributions. Fee-paying facilities do not receive government support.<sup>2,3)</sup> In 2000, there were 13,907 residents in 250 facilities (93 non-fee-paying, 102 fee-paying, 55 non-profit); 4,872 of the residents were in non-fee-paying facilities.<sup>3)</sup> At present, there is a scarcity of research carried out on the nutrition and health status of the elderly for the following reasons: high expenditure of time and resources is needed in studying dietary intake in the elderly, difficulty in obtaining permission from the management and dietary staff of the institutions concerned, a lack of reference information on which to base an analysis and interpret the results, and a lack of records on individuals re-

Accepted: January 5, 2002

<sup>§</sup>To whom correspondence should be addressed.

garding biochemical measurements, past medical history, lifestyle, history of taking medications, etc.<sup>4</sup> Nutritional assessment in the elderly is very important, because unidentified nutrient deficiencies, which are easily prevented and treated, could become the underlying causes of diseases. Nutrition surveys of elderly care facilities are needed for establishing management protocols appropriate for these facilities.<sup>4</sup>

The elderly in care facilities are disadvantaged regarding health and nutrition. Meal management in the care facilities for providing three meals a day, and therapeutic diets for certain disease conditions, become very important in maintaining good nutrition and health.<sup>6</sup> However, only 16.5% of the non-fee-paying facilities, 12.5% of the non-profit facilities, and 33.3% of the fee-paying facilities employ dietitians, which implies that overall nutrient intake and balance could be at risk due to a lack of nutrition professionals involved in the care of the elderly.<sup>2</sup>

Mild-to-moderate protein and energy undernourishment has been associated with more frequent hospitalizations in nursing home residents. Protein undernourishment has also been associated with increased rates of infection and mortality.<sup>7</sup> Nursing home residents are often at high risk for developing nutritional deficiencies and disorders that require appropriate and timely intervention. Estimates of malnutrition vary widely, depending on the definition and sample used. Keller reported that the rate of malnutrition among residents of individual nursing homes was estimated to range from 12% to 85%, and 45% were found to have mild to severe undernutrition.<sup>8</sup>

The causes of nutrient deficiency in elderly residents in nursing homes could be due to inadequate dietary intakes and/or increased nutrient requirements due to diseases. Despite the existence of regulations for nursing homes designed to satisfy the nutrient requirements of the residents by good menu planning and to provide hygienic foods under the supervision of dietitians, a lack of mechanisms to guarantee and support the regulations might lead to nutrient deficiency and imbalance. In Korea, previous studies mainly dealt with the elderly population staying in their own homes<sup>9,19</sup>; only a few studies are available on the institutionalized elderly.

The present study selected 3 non-fee-paying nursing homes in the Daejeon and Chungchong area in order to study nutrient intakes, self-perceived health status, presence of diseases, and general health of the residents. The results would provide insight into the management and care of the population.

## METHODS

### 1. Subjects

Out of 10 non-fee-paying nursing homes in the Daejeon and Chung-chong area (1 in Daejeon, 5 in Chung-Nam, and 4 in ChungBuk), permission to study was granted by 3 nursing homes. The research was undertaken from July 21 to August 1<sup>st</sup> in 1997 using a total of 86 subjects, 38 male and 48 female, who could understand the questions and communicate effectively.

### 2. Questionnaire and methods of investigation

#### 1) Questionnaire

The present study was conducted by interviewing the residents using the questionnaire. The questions asked comprised of general questions, self-perceived health status, presence of diseases, dental conditions, and individual medical history questions. There were five general questions: on age, sex, level of schooling, length of residency in the present facility, and past occupations. There were eleven self-perceived health status questions: wearing glasses, blurred sight & cloudy eyes, hearing ability, any buzzing in the ears, joint pains, lumbago and shoulder pains, dizziness, catching a cold, palpitation of the heart, short of breath at ordinary times, and indigestion. The frequency and seriousness of the symptoms were also questioned. Any current conditions the subjects may be suffering from, such as neuralgia, hypertension, digestive diseases, anemia, stroke, diabetes, lumbago, surgical history, respiratory illnesses, intestinal tumor, constipation, asthma, and presence of phlegm, were questioned. Managers and cooks were interviewed as to the history of the facility, management, capacity, number of current residents, personnel, and the quantity of donated foods.

#### 2) Anthropometric measurements

Weight and height of the subjects were measured, and the BMI (Body Mass Index: weight in kg/ height<sup>2</sup> in meters) was calculated for each subject.

#### 3) Measurements of dietary intake

The estimated food record method for 2 days was used for measuring dietary intake. It is difficult for the elderly to accurately estimate and remember quantities of foods they have taken. The day before the survey, the enumerators visited the nursing homes in order to familiarize themselves with the institutional setting for preparing and

providing meals and we spend 2 days more in each nursing home. On the day of the survey, food intakes from 3 meals, and snacks, for each resident were estimated and recorded. For the accurate calculation of nutrients, food preparation was observed, and the weights of the fresh ingredients and of the cooked food were recorded. The amount of food served and plate waste were estimated. This estimated food record method is a method recommended for a large group, because it is not a heavy burden on subjects and facilitates better cooperation from the subjects and the personnel.<sup>23)</sup> Five individual plate servings and five plate wastes were weighed, and the rest of the individual servings and plate wastes were estimated on the basis of the measured weights in order to minimize interference with the subjects.

#### 4) Data analysis

Statistical analysis was performed by using the SPSS program. General information on the facility, characteristics of the subjects, perceived current health status, and illnesses were included. The estimated food intake was converted to weights, and nutrient intakes were calculated using the nutrient content of foods.<sup>24)25)</sup> Means and standard deviations of each nutrient were calculated for males and females separately, and the percentage of the Recommended Dietary Allowances (RDA) for Koreans was calculated for each nutrient. Anthropometric measurements were also statistically analyzed.

## RESULTS AND DISCUSSION

### 1. General characteristics of the nursing homes

The three nursing homes surveyed (A, B, and C) opened 46, 15, and 3 years ago, respectively, and all were entirely supported by the government. As shown in Table 1, there were more female than male residents, and the total occupancy rate was 70% of the capacity. According to the management, the reason for the under-occupancy is the strict criteria for admission: the persons with no financial means to support themselves and without children. Lack of the awareness in the community is partly responsible for this under-occupancy. The annual averages for admission, leaving, and deaths were 13 (range 12 to 15), 3 (range 1 to 8), and 7 (range 2 to 11), respectively. As shown in Table 1, there were more than 1 office worker and nurse in each nursing home. However, there were no dietitians. Two homes had a cook and all three homes had one or two assistant cooks. It appears that cooks and assistant cooks were in charge of menu

**Table 1.** Number of current residents, percentage of total residence capacity, and personnel status of the elderly-care facilities

Characteristics of the facility		Facility		
		A	B	C
Number of current residents (N)	Male	31	24	12
	Female	40	32	25
	Total	71	56	37
Percentage of total Residence capacity (%)	Male	62	63	48
	Female	80	64	100
	Total	71	73	72
Number of personnel	Dietitian	0	0	0
	Cook	1	0	1
	Cook-assistant	0	1	1
	Nurse	1	2	1
	Office worker	6	1	2
Amount of food donated (per year)	Cereals (kg)	100	400	80
	Meats (kg)	60	900	190
	Fishes (kg)	0	0	0
	Vegetables (kg)	0	120	0
	Fruits (kg)	15	12	36
	Processed food (kg)	250	100	10
	Steamed rice cake (box)	24	12	12

planning and nutritional care of the residents.

Nursing home A, which is situated in an urban area, had a large amount of food donated, such as bread and steamed rice cakes by the general public, religious groups, and charity groups. Nursing home B, which is in a farming area, had a large amount of meat and vegetables donated. Nursing home C, which is relatively new, had the least overall amount of donation, but received relatively large amounts of fruits from the neighboring orchards. The type and extent of the donation depended on the location of the nursing home.

### 2. General characteristics of the residents

General characteristics of the elderly subjects (38 male and 48 female) are presented in Table 2. The predominant age for males was 76–80 years, and 81 to 85 years for females. Twenty-one percent of men and 42% of women were over 81 years. Seventy percent of the subjects have stayed in the nursing home for 1–5 years. Regarding the level of education, 55% of males and 71% of females did not complete elementary school. These results are similar to those reported in another study on the elderly population who stayed at home in the rural area of Kyong-Nam.<sup>19)</sup> Regarding previous occupations, 60% of men and 42% of women were engaged in farming, approximately 10% of both men and women were in commerce, and 8% of men and 42% of women had had no

jobs. Other occupations included construction worker, carpenter, and public servant. Thirty-six percent of the subjects were suspected to have children, but this figure was not accurate as the subjects avoided the question due to the risk of disqualification. One cannot be admitted to a nursing home if one has children.

**Table 2.** General characteristics of the elderly subjects (Number (%))

Characteristics	Male (N = 38)	Female (N = 48)	Total (N = 83)
<b>Age (years)</b>			
60 - 65	5 (13.2)	4 (8.3)	9 (10.5)
66 - 70	6 (15.8)	5 (10.4)	11 (12.8)
71 - 75	7 (18.4)	8 (16.7)	15 (17.4)
76 - 80	12 (31.6)	11 (22.9)	23 (26.7)
81 - 85	7 (18.4)	13 (27.1)	20 (23.3)
> 86	1 (2.6)	7 (14.6)	8 (9.3)
<b>Length of residency (years)</b>			
< 1	2 (5.3)	5 (10.4)	7 (8.1)
1 - 5	27 (71.1)	33 (68.8)	60 (69.8)
6 - 10	2 (5.3)	8 (16.7)	10 (11.6)
> 11	7 (18.4)	4 (4.2)	9 (10.5)
<b>Education level</b>			
Illiterate	21 (55.3)	34 (70.8)	55 (64)
Elementary school	13 (34.2)	9 (18.8)	22 (25.6)
Middle school	1 (2.6)	4 (8.3)	5 (5.8)
High school	1 (2.6)	1 (2.1)	2 (2.3)
University and higher	2 (5.3)	0 (0)	
<b>Previous occupation</b>			
Farmer	23 (60.5)	20 (41.7)	43 (50)
Commerce	4 (10.5)	5 (10.4)	9 (10.5)
None	3 (7.9)	20 (41.7)	23 (26.7)
Miscellaneous	8 (21.1)	3 (6.3)	11 (12.8)

### 3. Anthropometric measurements

Height, weight and BMI (Body Mass Index) of the subjects are presented in Table 3. The average heights of subjects were  $158.3 \pm 5.88$  cm (males) and  $140.7 \pm 19.8$  cm (females). Average weights were  $53.0 \pm 7.14$  kg and  $46.2 \pm 9.35$  kg for men and women, respectively. Compared to the reference weight of 60 kg for men and 51 kg for women for over 75 years,<sup>20</sup> the male subjects were 88% of the reference weight and the female were 90%.

**Table 3.** Height, weight and BMI of the elderly subjects

	Male	Female
Height (cm)	$158.3 \pm 5.88^1$	$140.7 \pm 19.8$
Weight (kg)	$53.0 \pm 7.14$	$46.2 \pm 9.35$
BMI	$21.16 \pm 2.45$	$22.45 \pm 3.65$
<b>Distribution of BMI</b>		
< 20	12 (31.6) <sup>2</sup>	14 (29.2)
20 - 27	26 (68.4)	30 (62.5)
> 27	0	4 (8.3)

1) Mean  $\pm$  SD    2) N (%)

Regarding height, the male subjects had 96% of the reference values and the female, 92% (reference height: 166 cm for male and 152 cm for female). Compared to another study conducted in the Seoul and Incheon areas<sup>22)</sup> (height: male 161.9 cm, female 145.9 cm; weight: male 59.3 kg, female 49.2 kg), both height and weight values in the present subjects were slightly lower. Average BMI values were calculated (male =  $21.7 \pm 2.45$  and female =  $22.4 \pm 3.65$ ), and these are within the normal range. There were no men whose BMI was over 27 (which is an indicator for overweight), but 8.3% of the women were overweight. On the other hand, about 30% (31.6% of the males and 29.2% of the females) had BMI values lower than 20, which indicates underweight. Undernutrition rather than overnutrition seems of most concern for the present study population.

## 4. Health status

### 1) Dental conditions

As shown in Table 4, total loss of teeth was seen in 37% of male and 31% of female subjects, and complete dentures were worn by 13% of males and 21% of females. 16% of the male and 8.3% of female subjects had some of their own teeth. Partial dentures were worn by 5% of the males and 4% of the females. Having one's complete set of teeth was recorded in 29% of the male and 35% of the female subjects. Overall, 55% of men and 56% of women either had no teeth or wore dentures; this implies that more than half of the subjects must have a problem in chewing food. Compared to the results of another study showing that 5.8% of the subjects had no teeth in the elderly welfare facilities in Jeonbuk,<sup>21)</sup> the dental problems were much more serious in this study.

**Table 4.** Dental status of the elderly subjects, by sex (%)

Dental status	Male	Female
No teeth	36.8	31.3
Complete dentures	13.2	20.8
Partial dentures	5.3	4.2
Partially own teeth	15.8	8.3
Completely own teeth	28.9	35.4

### 2) Past medical history

The medical history described by the subjects were as follows; 28% continued to be healthy, 9% had not been healthy since their youth, and 63% became ill or their health deteriorated with aging. It appears that more than 70% of the subjects considered themselves unwell.

### 3) Self-perceived general health status

In order to determine current health status, 11 questions were asked. For each question, the subjects had to respond either by the frequencies such as none, often, or always, or by the severity such as none, mild, and severe. The results are presented in Fig. 1.

For reading, 35% of women and 26% of men always wore glasses, and 27.1% of women and 2.6% of men often wore them. Fifty percent of the females and 42% of the males always had blurred vision and cloudy eyes. Impaired sight was more obvious in the female subjects, compared to the male subjects, in the study. Constant hearing difficulties were experienced by 33% of females and 18% of males, and occasional hearing difficulties were reported by 10% of female and 8% of male subjects. Constant or occasional buzzing in the ear was experienced by 40% of the females and 13% of the males. It appears that the female subjects faced more difficulties in seeing and hearing in general, which can be attributed to their higher average age compared to the male subjects.

Twenty three percent of both females and males quite frequently caught colds. Suffering from constant indigestion was recorded for 31% of females and 8% of males: oc-

casional indigestion was experienced by 6% of females and 18% of males. Always as well as often palpitations were felt by 38% of the females and 26% of the males. Fifteen percent of the females and 16% of the males always felt short of breath without exertion. Severe joint pains were experienced by 42% of the female and 34% of the male subjects. Lumbago and shoulder pains were always felt by 46% of the females and 34% of the males. Constant dizziness was felt by 25% of the females and 16% of the males, and occasional dizziness by 29% of the females and 32% of the males.

Female and male subjects suffered more difficulties from cloudy eyes, joint pains and lumbago and shoulder pains than any other symptom. Except for less heart palpitations in females compared to males, overall female subjects felt worse off than the male subjects in terms of their health status, that can be attributed to higher average age of the female subjects compared to the male subjects. Another study conducted by Koo *et al.*<sup>13</sup> in Seoul also confirmed that the female subjects have more complaints about their health than male subjects; the main problems faced by female subjects were difficulties in seeing, lumbago/shoulder pains, hearing difficulties,

and dizziness in a descending order of importance.

#### 4) Chronic disease

Overall, the majority of the subjects considered themselves to be in poor health, or to suffer from chronic diseases, except the 28% of the subjects who continued to remain healthy. 60 percent of the subjects claimed to have at least one disease, and 17% felt they had more than two chronic diseases. This figure is lower than the report by the census of the elderly carried out by the Department of Health and Welfare in 1998, in which 88% of the elderly had at least one chronic disease, 25% had two, and 35% had three.<sup>18</sup> Another study conducted in the Seoul and Incheon area reported that 65.4% of the institutionalized elderly had chronic diseases<sup>22</sup>; this incidence is slightly higher than in our study subjects.

As shown in Fig. 2, neuralgia was the leading chronic disease (55%) in male subjects, which was followed by hypertension (15%), gastrointestinal disease (10%), anemia (10%), long-term effect of stroke (5%) and diabetes (5%). In the case of female subjects, neuralgia and hypertension were the leading complaints (39%), followed by stroke (7%), anemia (5%), gastrointestinal diseases (5%), and liver & kidney disease (2%). The rate of hypertension was much higher in the females than in the males, and anemia was much lower in the females than in the males. According to the research carried out on female residents in non-fee-paying facilities by Song *et al.*,<sup>21</sup> the incidence of anemia (34%) was higher and hypertension was lower than in the present study. In the same study, the rate of neuralgia and joint pains was 67.4%, which is similar to the results of the present study. The Department of Health and Welfare reported in 1988 that among the elderly over 65 years old, 34.2% had arthritis, 23.1% lumbago/back pain, and 19.4% had hypertension. The incidence of all three diseases in female subjects was twice that of males. This is similar to the present results except for the higher incidence of neu-

ralgia in men in the Department of Health and Welfare study. Koo *et al.*<sup>13</sup> reported that 38% of the male and 54% of the female elderly below the government poverty line in Seoul had arthritis/rheumatic arthritis, while 9% of the males and 32% of the females had hypertension. It appears that the incidence of neuralgia, arthritic conditions and hypertension were the main complaints among the elderly in most studies, and their rates were different between males and females.

#### 5. Nutrient intake

The average nutrient intakes of the subjects are presented in Table 5. Total daily calorie intake was 2269 kcal (113.5% RDA) for males and 2066 kcal for females (121.6% RDA). Protein intake was 102 g (146.8% RDA) for males and 86 g (144.8%) for females. Fat intake was 15.03 g (6% of total calories) for males and 14.58 g (6.4% of total calories) for females; these were only half the amounts found in other studies. Carbohydrate intake was 414.6 g in males and 379.99 g in females. The percentage contribution to total calorie intake by carbohydrate, protein, and fat was 75.5 : 18.4 : 6.1 for males and 75.8 : 17.5 : 6.7 for females, showing that the diet was relatively high in carbohydrate. The intake of dietary fiber was some low, 5.4 g for men and 5.7 g for women. The imbalance in the intake of the three major energy nutrients, that is, too much carbohydrate and low fat intake, may be due to the poor dental conditions that prevented the subjects from chewing meat and vegetables as well as the menus comprised of the cooking method using small amount of fat such as *Zzim*, *Muchim* and *Jorim* in those facilities. The personnel mentioned that the subjects supplement their daily intakes with the bread and rice cakes donated to the institution. The daily intake of cholesterol was 180 mg for males and 164 mg for females. The polyunsaturated/monounsaturated/saturates (PMS) ratio was 1 : 1.3 : 1.6 in males and 1 : 1.3 : 1.8 in females, which means that the intake of essential fatty acids might be short to the elderly, especially considering that the recommended ratio of PMS in Korea is 1 : 1 : 1 and the recommended amount of essential fatty acid is above 1–2 percent of total energy consumption.

Calcium intake was close to the RDA for both the males and females, but phosphorus was excessive at 2.6 times the RDA. The excessive intake of phosphorus could affect an imbalance in bone metabolism, thus involve a risk of the abnormalities in bone health.

A study in Sweden showed that virtually all institutionalized elderly women could be osteoporotic.<sup>27</sup> Iron in-

Fig. 2. Disease status of the elderly subjects. 1) GID: gastrointestinal disease.

**Table 5.** Daily calorie and nutrient intake of the elderly subjects

Nutrient	Male (N = 38)		Female (N = 48)	
	Mean $\pm$ SD	% of RDA	Mean $\pm$ SD	% of RDA
Calorie (kcal)	2269.48 $\pm$ 418.06	113.5	2066.49 $\pm$ 361.79	121.6
Protein (g)	102.74 $\pm$ 39.17	146.8	86.91 $\pm$ 35.67	144.8
Fat (g)	15.03 $\pm$ 3.14		14.58 $\pm$ 2.98	
Cholesterol (mg)	179.81 $\pm$ 70.81		163.95 $\pm$ 82.03	
Carbohydrate (g)	414.61 $\pm$ 86.8		370.99 $\pm$ 69.00	
Fiber (g)	5.42 $\pm$ 1.42		5.71 $\pm$ 6.79	
Calcium (mg)	668.72 $\pm$ 254.32	95.5	686.95 $\pm$ 323.72	98.1
Phosphorus (mg)	1858.12 $\pm$ 790.83	265.4	1834.10 $\pm$ 894.80	262.0
Iron (mg)	14.67 $\pm$ 3.34	122.3	17.56 $\pm$ 11.96	146.3
Sodium (mg)	2529.94 $\pm$ 614.27		2233.60 $\pm$ 974.10	
Potassium (mg)	2482.37 $\pm$ 740.96		2213.86 $\pm$ 738.93	
Vitamin A (R.E*)	209.50 $\pm$ 84.45	29.9	265.02 $\pm$ 234.90	37.9
Vitamin B <sub>1</sub> (mg)	0.86 $\pm$ 0.18	86.2	0.77 $\pm$ 0.17	76.8
Vitamin B <sub>2</sub> (mg)	1.09 $\pm$ 0.25	91.3	1.07 $\pm$ 0.33	89.6
Niacin (mg)	28.01 $\pm$ 13.44	215.4	24.06 $\pm$ 12.26	185.1
Vitamin B <sub>6</sub> (mg)	1.77 $\pm$ 0.97	118.3	1.44 $\pm$ 0.90	95.7
Vitamin B <sub>12</sub> (g)	3.31 $\pm$ 0.94		3.13 $\pm$ 1.04	
Ascorbic acid (mg)	53.77 $\pm$ 37.02	97.8	49.09 $\pm$ 26.53	89.3
Vitamin E (mg)	3.27 $\pm$ 0.71	32.7	3.05 $\pm$ 0.90	30.5
P/M/S ration	1/1.3/1.6		1/1.3/1.8	

\*: Retinol Equivalents

take was above the RDA (males had 122.3% of the RDA, and females 146.3%). The intakes of iron as well as calorie and protein tended to be satisfactory. Intakes of Vitamin A and E, whose roles include delaying aging and providing antioxidants, were only 30% of the RDA. This high carbohydrate/low fat diet seems to be accompanied by low intake of vitamin E and vitamin A. The main source of vitamin E is vegetable oil; thus more vegetable oil should be included in the diet. A study on institutionalized elderly in Spain revealed the similar result to our data in terms of being deficient in vitamin E intake.<sup>20</sup> The intake of vitamins B<sub>1</sub> and B<sub>2</sub> was 70–90% of the RDA, intakes of vitamin C and B<sub>6</sub> were 90% to 110% of the RDA, and the intake of niacin was double the RDA.

Compared to the report by Hong<sup>10</sup> whose subjects were the elderly staying at home, the present subjects had higher intakes of protein, carbohydrate, iron, niacin, and vitamin C, but lower intakes of fat and vitamin A. In addition, compared to a study carried out in the Chungchong region 20 years ago,<sup>9</sup> the present subjects had higher intakes of protein, carbohydrate, calcium, phosphorus, and niacin, and lower intakes of fat, vitamin A, B<sub>1</sub>, B<sub>2</sub> and C. Song *et al.*<sup>20</sup> reported low intakes of Ca and B<sub>2</sub> especially, and also low intakes of vitamin A, protein, and niacin in the female residents in non-fee-paying facilities. The contribution of fat calories in the study by Song *et al.* was 10.2% of the total calorie intake, which is slightly higher than in this study; carbohydrate's contribution in the Song *et al.*

study was 78% that is similar to the present study. Lee *et al.*<sup>16</sup> studied rural women who stayed alone in their own homes and found that calorie and protein intakes were low, and fat intake was high; but compared to the study by Son *et al.*,<sup>29</sup> using the urban elderly below the government poverty line, their intakes of fat and vitamin A were as low as our subject's intakes. In Korea the seasonal effects on the intake of vitamins A and C, even in the same area, is well known. The data about vitamin intake could have been quite different if the study was done in other season.

The intakes of calcium and vitamin B<sub>2</sub> mostly depend on the consumption of milk. Fat and vitamin E intake depends on the use of vegetable oil. Although this study was restricted to the Daejeon/Chungchong area, the summer season, and the survey for two day period, the importance of increasing vitamins A and E to boost antioxidant function is apparent. The main source of vitamin E is vegetable oil; thus more vegetable oil should be included in the diet.

## RECOMMENDATION

From this results one can recommend that the supplementation of green/orange vegetables providing a source of vitamin A, together with vegetable oils conveying vitamin E, should be emphasized in menu planning in the nursing home studied, and appropriate recipes be developed. The employment of dieticians, who can plan menus in

consideration of the physiological conditions and preferences of each elderly on the basis of the limited budget, would improve nutrient intake. Regarding donated food by visitors and family, it is important to educate the community on the importance of the kinds of donated food such as fish/beans/meat/fruits/vegetables/milk products or processed foods which can be stored or frozen, not refined cereal and high carbohydrate food in order to improve the balance in nutrient intake in the institutionalized elderly.

### Literature cited

- 1) National Statistical Office. The future estimated population, trend of population structure by age groups and dependency ratio: pp. 1960-2050, National Statistical Office, Korea, 2001
- 2) Yang IS, Lee JM, Chai IS, Yoon G. Food service management systems at elderly-care sites for the improvement of elderly welfare policies in Korea. *Korean J Nutr* 29: 830-839, 1996
- 3) Lee YS. Elderly care facilities. In proceedings of the annual meetings of federation of the Korean Gerontological Society for 1994, pp.27-28, 1994
- 4) Sahyoun NR, Otradovec CL, Hartz SC, Jacob RA, Peter H, Russell RM, McGandy RB. Dietary intakes and biochemical indicators of nutritional status in an elderly institutionalized population. *Am J Clin Nutr* 47: 524-533, 1988
- 5) Abbasi AA, Rudman D. Undernutrition in the nursing home: prevalence, consequences, causes and prevention. *Nutr Rev* 52: 113-122, 1994
- 6) Cilbride JA, Simko HD. Role functions do dietitians in New York State Nursing Homes. *J Am Diet Assoc* 86: 222-227, 1986
- 7) Keller HH. Malnutrition in institutionalized elderly: how and why? *J Am Geriatr Soc* 41: 1212, 1993
- 8) Zimmerman DR, Jewell KE, Karon SL. Using resident assessment data to improve nutritional care in nursing homes: the power of information. *Nutrition* 14: 410-415, 1998
- 9) Chung YJ. Dietary status of elderly people. *Reports Res Inst Natural Sci, Chungnam National University* 6: 57-63, 1979
- 10) Kang NE. A nutrition survey of urban elderly in Seoul with the analysis of dietary attitude after retirement. *Korean J Nutr* 19: 52-65, 1986
- 11) Cho YS, Lim HS. The nutrition and health survey of aged people in a rural area 2. Anthropometry, blood pressure, blood constituents, diseases and obesity Rate. *Korean J Nutr* 19: 382-391, 1986
- 12) Ko YS. Nutrition survey of the aged on Jeju Island. *J Korean Home Economics* 19: 41-53, 1981
- 13) Koo JO, Park YJ, Kim JQ, Lee YH, Yoon HY, Son SM. Nutritional and health status of Korean elderly from low-income, urban areas and improving effect of meal service on nutritional and health status. *Korean J Comm Nutr* 1: 215-227, 1996
- 14) Hong SM, Choi SY. A study on meal management and nutrient intake of the elderly. *J Korean Society of Food Science and Nutrition* 25: 1055-1061, 1996
- 15) Son SM, Park YJ, Koo JO, Lee YN, 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 Comm Nutr* 2: 63-73, 1997
- 16) Lee JH, Kim HS. Comparison of nutritional status and immunocompetence of elderly women in urban and rural area. *Korean J Nutr* 31: 1174-1182, 1998
- 17) Baek JW, Koo BK, Kim KJ, Lee YK, Lee SK, Lee HS. Nutritional status of the long-lived elderly people in Kyungpook Sung-Ju Area (I). Estimation of Nutrients Intake. *Korean J Nutr* 33: 438-453, 2000
- 18) Ministry of Health and Welfare. Elderly health status in report of 1998 National Health and Nutrition Survey, pp.38-39, 1999
- 19) Park MY, Lee KH, Youn HS. Nutrition status of the rural elderly living in Kyungnam. *Korean J Comm Nutr* 6(3S): 527-541, 2001
- 20) Song YS, Chung HK, Cho MS. The nutritional status of the female elderly residents in nursing home 1. Nutritional and biochemical health status. *Korean J Nutr* 28: 1100-1116, 1995
- 21) Song YS, Chung HK, Cho MS. The nutritional status of the female elderly residents in nursing home 2. Social, psychological and physical health status. *Korean J Nutr* 28: 1117-1128, 1995
- 22) Han MJ, Koo SJ, Lee YS. The study of food habit and degree of depression in nursing home and private home living elderly. *Korean J Dietary Culture* 13(5): 475-486, 1998
- 23) Chang YK, Chung YJ, Moon HK, Yoon JS, Park HR. Nutritional assessment. Shin-gwang Publishing Co., Seoul, 1998
- 24) Food composition table, 5th revision. National rural living science institute, Korea, 1996
- 25) Japanese Food Composition Table of fatty acid. cholesterol vitamin E, 齒藥出版株式會社, 1989
- 26) Recommended dietary allowances for Koreans. 6th revision, The Korean Nutrition Society, Seoul, Korea, 1995
- 27) Ekman A, Michalsson K, Ljunghall S, Mallmin H. Almost all institutionalized women are osteoporotic, when measured by heel and finger ultrasound. *J Internal Medicine* 249: 173-180, 2001
- 28) Gamez C, Artacho R, Ruiz-Lopez, Puerta A, Lopez M C. Nutritional status of vitamin A and E in institutionalized elderly people in Granada (Spain). *J Nutritional Science and Vitaminology* 42: 397-405, 1996
- 29) Son SM, Park YJ, Koo JO, Mo SM, Yoon HY, Sung CJ. Nutritional and health status of Korean elderly from low-income, urban areas and improving effect of meal service on nutritional and health status I. Anthropometric measurement and nutrient intake. *Korean J Comm Nutr* 1: 79-88, 1996