

Dietary Problems among Middle-Aged Japanese Men

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ABSTRACT

Balanced intake of appropriate nutrients is the key to sustaining and promoting health as well as preventing and treating diseases. It is not always easy, however, to take balanced nutrition and various related factors must be taken into consideration. This report provides a summary of studies that have examined the nutrient intakes of Japanese middle-aged men and the relationship of this intake to drinking, job-related separation from families, and health practices. The alcohol consumption of Japanese middle-aged men has more than tripled in the last forty years. When nutrient intake was examined in relation to alcohol consumption, it was discovered that the maximum acceptable alcohol consumption was approximately 23 grams (about two drinks) of pure alcohol, provided the level of nutrient intake for drinkers was equal to that of non-drinkers. The alcohol energy ratio was approximately 5%. It was also discovered that middle-aged men's eating habits deteriorate when they relocate to new posts without their families and live by themselves. Compared to those living with their families, a higher proportion of those living alone have unfavorable eating habits including skipping breakfast or lunch, having a late lunch, and eating and drinking after dinner until bedtime. When Breslow's seven health practices, nutrient intake, and consumption weight by food group were examined, it was discovered that the group that had many beneficial eating and living habits consumed plenty of legume, pulses, fruit, green yellow vegetables and milk products. Their intake of vitamins and minerals was high and the results of a physical examination proved to be excellent. According to nutrition surveys conducted in Japan, China, the United Kingdom and the United States using a 24-hour recall method with common protocols and strict controls to ensure high levels of accuracy and cross-study validity, the Japanese had the highest cholesterol intake and the lowest dietary fiber intake among the four countries. Also, the alcohol energy ratio of the Japanese exceeded 8%, the highest among the four countries, while their intake of magnesium and iron was the lowest. These results indicate that it is necessary to enhance nutritional education for middle-aged men and to reinforce the social environments in which they live and work in order to promote proper diet and nutrition in Japan. (*J Community Nutrition* 5(2) : 105~111, 2003)

KEY WORDS : middle-aged Japanese men · alcohol consumption · job-related separation from families · health practices and health examination results · intake of nutrients.

Introduction

According to national nutrition surveys conducted in Japan in recent years, average nutrient intake is estimated to be at an acceptable level (Ministry of Health, Labour and Welfare of Japan, 2001). When the results are examined closely by gender and age group, however, each group has its respective

challenges. Among middle-aged men between the ages of 35 and 65, an important concern is to prevent and treat chronic diseases (lifestyle-related illnesses) that occur due to poor lifestyle. These people, therefore, must strive to improve their eating habits and life practices, with appropriate nutrition being a high priority. However, the actual living environments and social conditions surrounding middle-aged men sometimes contribute to their inappropriate diets. This situation must be observed carefully. This report summarizes the studies on middle-aged men that have examined the relationships between nutrient intake and drinking, job-related separation from families, and health practices, as well as consumption by food group and physical condition.

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Also made available in this report, is data from an international collaborative study (the authors of this report also participated in this study) that investigated nutrient intake in Japan, China, the United Kingdom and the United States among middle-aged men. The distinctive characteristics of the Japanese, compared to those in other countries, will be discussed.

Drinking and Nutrient Intake

Although drinking may have positive side effects such as relieving stress and developing smooth relationships with other people, excessive drinking may also have a direct and adverse impact on health and daily food consumption. According to the national nutrition survey in 2001, 60% of Japanese middle-aged men drink more than three times a week with more than 180 milliliters of *sake* or 633 milliliters of beer (about two drinks) being consumed each time. This is not a situation that should be dismissed as unimportant (Ministry of Health, Labour and Welfare of Japan, 2003). On the other hand, the average annual alcohol consumption per person in 2000 was equivalent to 6.5 liters of pure alcohol, almost equal to that of Americans. The average intake has more than tripled in the last 44 years since it was only about two liters in 1955 (National Tax Agency Japan, 2003). These figures, however, merely represent dividing the total annual alcohol consumption by Japan's total population. It is abundantly clear that those who drink habitually consume more than 6.5 liters of alcohol on average each year.

There are several reports that examine the relationship between alcohol consumption, nutrient intake and consumption by food group targeting Japanese. Nakajima *et al.* used a food consumption frequency survey method to calculate

and review daily consumption by food group, nutrient intake and a total energy ratio (intake energy ratio) for protein, lipid, carbohydrate and alcohol based on weekly frequency, type, and amounts of food and alcohol consumed. The results show that as alcohol consumption increases, the amount of food, especially grain that is a source for carbohydrate, decreases (Nakajima *et al.* 1992).

K. Yoshita conducted a three-day nutrition survey based on the dietary records of middle-aged men between the ages of 35 and 64 and examined relationships between the amount of pure alcohol consumed, nutrient intake and consumption by food group. It was found that as alcohol consumption increased, total energy intake also increased. However, if pure alcohol consumption exceeded 23 grams (about two drinks), energy intake from sources other than alcohol (non-alcohol energy) decreased. Energy derived from alcohol is commonly called empty calories and contains few nutrients. Therefore, as the pure alcohol consumption increases to over 23 grams, it becomes more difficult to receive the appropriate type and level of nutrients (Table 1). With respect to consumption by food group, as alcohol consumption increased, the consumption of fish also increased although the consumption of grain, fruits and dairy products decreased. In terms of general physical condition, those with a pure alcohol consumption exceeding 23 grams showed higher values for blood serum γ -GTP, neutral fat and systolic blood pressure than those with no alcohol consumption (Table 2). These results suggest that an acceptable level of alcohol consumption for Japanese middle-aged men compatible with a proper nutrient intake is 23 grams (about two drinks; approximately 5% in alcohol energy ratio) or less (K. Yoshita 1998).

Saito, Adachi and other researchers also reported similar

Table 1. Comparison of energy and macronutrients intakes according to alcohol intake

	Group I (n = 78)	Group II (n = 141)	Group III (n = 98)	Group IV (n = 45)
Total Energy, kcal/day	1,856.3 ± 314.9	1,993.3 ± 322.2*	2,111.6 ± 278.8***	2,287.2 ± 360.9***
Energy from Alcohol, kcal/day	0 ± 0	122.2 ± 70.4	318.0 ± 71.7	685.4 ± 237.5
Energy from Non-Alcohol, kcal/day	1,856.3 ± 314.9	1,871.1 ± 315.2	1,793.6 ± 276.7	1,601.7 ± 358.9***
Alcohol Energy, %kcal	0 ± 0	6.1 ± 3.5	15.2 ± 3.7	30.0 ± 8.8
Total Protein g/day	73.2 ± 11.8	77.6 ± 13.8	78.6 ± 13.4	79.7 ± 16.2
Total Fat g/day	54.1 ± 15.5	54.9 ± 15.0	53.8 ± 15.3	49.3 ± 17.1
Carbohydrate g/day	261.5 ± 51.1	267.7 ± 49.4	260.6 ± 45.6	240.7 ± 48.4*

Mean ± Standard Deviation

Group I : Group with Alcohol Intake 0g/day

Group III : Group with Alcohol Intake 23g/day < [] < 46g/day

* : p < 0.05, *** : p < 0.001, Significant Difference (vs. Group I)

Group II : Group with Alcohol Intake 0g/day < [] < 23g /day

Group IV : Group with Alcohol Intake > 46g/day

Table 2. Comparison of health examination results according to alcohol intake

	Group I (n = 78)	Group II (n = 141)	Group III (n = 98)	Group IV (n = 45)
Age, years/old	49.8 ± 4.2	48.9 ± 4.3	49.6 ± 4.7	49.9 ± 4.7
Height, cm	169.2 ± 6.0	168.9 ± 4.9	169.2 ± 4.9	169.2 ± 3.5
Weight, kg	70.6 ± 9.5	69.9 ± 8.1	70.5 ± 8.7	71.5 ± 11.0
Body Mass Index, kg/m ²	24.6 ± 3.0	24.4 ± 2.4	24.5 ± 2.3	25.0 ± 3.8
Systolic Blood Pressure, mm/Hg	119.6 ± 18.0	119.0 ± 14.1	124.2 ± 16.5	124.4 ± 16.4
Diastolic Blood Pressure, mm/Hg	79.3 ± 12.8	80.2 ± 10.1	83.4 ± 10.8	85.2 ± 12.7 ⁺
AST (GOT), u/l	24.8 ± 11.6	22.4 ± 9.7	24.3 ± 14.5	29.1 ± 12.2
ALT (GPT), u/l	54.8 ± 31.4	46.9 ± 28.1	44.0 ± 26.0	52.5 ± 28.9
Gamma-GTP, u/l	38.3 ± 28.8	43.9 ± 29.2	59.4 ± 47.5 [*]	79.7 ± 69.5 ^{***}
Total Cholesterol, mg/dl	199.2 ± 36.5	202.1 ± 31.6	197.3 ± 32.5	196.2 ± 29.4
HDL Cholesterol, mg/dl	47.8 ± 12.3	49.3 ± 10.8	52.4 ± 11.9	52.9 ± 10.6
Triglyceride, mg/dl	146.8 ± 81.7	155.0 ± 69.4	164.1 ± 100.6	214.3 ± 173.0 ^{**}

Mean ± Standard Deviation

+ : p < 0.1, * : p < 0.05, ** : p < 0.01, *** : p < 0.001, Significant Difference (vs. Group I)

Group I : Group with Alcohol Intake 0g/day

Group II : Group with Alcohol Intake 0g/day < [] < 23g /day

Group III : Group with Alcohol Intake 23g/day < [] < 46g/day

Group IV : Group with Alcohol Intake > 46g/day

results although they used survey groups with different characteristics and different survey methods (Saito *et al.* 1995 ; Adachi *et al.* 2000).

Job-Related Separation from Families and Nutrient Intake

Many married Japanese middle-aged men leave their families at home and start living by themselves when asked by their employers to relocate to new posts in remote places where they cannot commute from their homes (job-related separation from families). According to the Ministry of Health, Labour and Welfare, approximately 319,000 married men relocated without taking their families in 1998, and the number is increasing (Ministry of Labour of Japan, 1998). This practice is not common in other countries and is fairly unique to Japan. Those who relocate without families must live by themselves and are less likely to receive support in their daily lives from spouses and other family members. Also, many Japanese middle-aged men fail to manage their diets adequately when on their own. It is necessary, therefore, to clarify the food consumption environment of those who relocated without families in order that effective nutritional education can be implemented on their behalf.

Kimura *et al.* conducted a nutrition survey in 1986 using a seven-consecutive day diet recording method that compared married men who relocated without their families and those living with their families. Both groups were men between

the ages of 26 and 55, and who worked for large companies in Japan. When the results were analyzed, it was found that by age group, in the younger generation, nutrient intake for those living alone was worse overall than those living with their families. In particular, their intakes of calcium and vitamin C were low. By contrast, in the older generation, those living alone had better nutrient intake than those living with their families (Kimura *et al.* 1990).

K. Yoshita *et al.* conducted a three-day nutrition survey using a diet recording method focusing on men between the ages of 35 and 64. These men were divided into two groups : one with a body mass index (BMI) of 25 or more, and the other with a BMI of less than 25. Consumption by food group and intake of energy and nutrients were then compared between those living alone and those living with their families. It was discovered that, in terms of consumption by food group, those living alone with a BMI of 25 or more consumed more alcohol, dairy products, meat and processed foods, and fewer legumes, than those living with their families. With respect to energy and nutrient intake, those living alone showed higher values for energy and lipid intake compared to those living with their families. In a group of men with a BMI of less than 25, those living alone consumed more alcohol and non-alcoholic drinks, and a lesser amount of potatoes, fruit and vegetables than those living with their families. For energy and nutrient intake, although there was no difference between the two groups in relation to energy, protein, lipid and carbohydrate intakes, those living alone

had less intake of iron, calcium, and vitamins A, C and E than those living with their families (K. Yoshita *et al.* 1993).

K. Yoshita *et al.* also compared diets and the results of physical examinations of those living alone and those living with their families in a separate research project. Those living alone generally showed a high level of unfavorable eating habits such as skipping breakfast or lunch, having a late lunch, and eating and drinking after dinner until bedtime (Table 3). Furthermore, those living alone with a BMI of 25 or more had higher values for AST (GOT), total cholesterol and systolic blood pressure than those living with their families (K. Yoshita *et al.* 1993).

Yamazaki and Hirayama also examined the influence of job-related separation from families on lifestyle and physical

condition. The results indicate that, after men relocated without their families, their alcohol consumption increased, their eating habits and nutrient intake worsened, and their smoking increased (Yamazaki *et al.* 2001 ; Hirayama *et al.* 2002).

In order to promote measures to prevent and treat diseases among Japanese middle-aged men, it is necessary to reinforce social support systems and take steps to improve nutritional education for those relocated without their families. These approaches, however, cannot be standardized as conditions vary widely by age group or BMI.

Health Practices and Nutrient Intake

In 1965, Belloc and Breslow examined a range of lifestyles in detail and discovered seven desirable living habits that lower mortality rates for each age group. These habits include not smoking, drinking alcohol in moderation or not drinking at all, practicing vigorous exercises regularly, maintaining an appropriate body weight, sleeping for seven to eight hours, eating breakfast every day, and not eating between meals unnecessarily. These are called Breslow's seven health practices (Belloc *et al.* 1972).

I. Yoshita *et al.* redefined cut-off points for the Japanese using these seven healthy living habits and conducted a survey on 1338 middle-aged men between 1997 and 1998. If a survey participant has one of the habits, he receives one point. If not, he does not receive any points. After the total

Table 3. Comparison of eating habits between men relocated without families and men living with their families

	Men relocated (n = 85)	Men living w/ (n = 591)
Skip breakfast	48(56.0)	137(23.2)**
Skip lunch	10(11.8)	37(6.3)+
Have lunch after 2 : 00 pm	22(25.9)	92(15.6)*
Eat between meals	26(30.6)	251(42.5)*
Have dinner after 8 : 00 pm	46(53.6)	284(48.1)
Consume more than 50% of daily food intake at dinner	28(32.9)	176(29.8)
Eat or drink something after dinner and before bedtime	38(44.7)	189(32.0)*

(Participants answered "yes" if the above behavior occurred more than three times a week..)

χ^2 : + p < 0.1, * : p < 0.05, ** : p < 0.01

Table 4. Intake of nutrients in the three groups according to total score of healthy life status

	Group L (n = 264)	Group M (n = 821)	Group H (n = 253)	L-M	L-H	M-H
Energy, kcal/day	2,183.9 ± 426.9	2,098.1 ± 376.3	2,051.8 ± 345.7	**	**	
Total Protein, g/day	80.0 ± 19.9	78.8 ± 17.0	78.4 ± 15.7			
Total Fat g/day	56.8 ± 17.3	55.9 ± 15.2	55.7 ± 15.6			
Carbohydrate non-fiber, g/day	271.2 ± 62.9	274.1 ± 54.3	278.9 ± 52.2			
Calcium, mg/day	470.6 ± 175.9	515.2 ± 184.5	551.6 ± 186.9	**	**	*
Iron, mg/day	9.3 ± 2.5	9.7 ± 2.3	9.7 ± 2.3			
Phosphorus, mg/day	1,081.8 ± 273.1	1,078.1 ± 242.0	1,095.5 ± 237.3			
Potassium, mg/day	2,571.4 ± 673.8	2,623.0 ± 620.2	2,684.8 ± 638.2			
Salt equivalent, g/day	12.3 ± 3.2	12.3 ± 2.9	12.1 ± 2.7			
Vitamin A potency, IU/day	1,813.8 ± 1,393.9	2,145.0 ± 2,012.7	2,260.9 ± 1,582.7	*		
Vitamin B1, mg/day	0.95 ± 0.30	0.98 ± 0.28	1.03 ± 0.30		**	
Vitamin B2, mg/day	1.33 ± 0.40	1.33 ± 0.36	1.35 ± 0.37			
Vitamin C, mg/day	80.7 ± 51.8	89.4 ± 45.7	95.6 ± 46.0	*	**	
Niacin, mg/day	18.2 ± 6.2	16.9 ± 5.3	16.3 ± 4.7	**	**	
Alcohol, g/day	33.1 ± 26.7	21.3 ± 22.4	12.5 ± 16.8			

Mean ± Standard Deviation

Group L : Group with total score 0 to 3 points

Group H : Group with total score 6 to 7 points

* : p < 0.05, ** : p < 0.01, Significant Difference

Group M : Group with total score 4 to 5 points

points were combined, three groups were formed; those in the top 25% of the total score, those in the middle 50%, and those in the lowest 25%. Between these three groups, physical condition, nutrient intake, consumption by food group, and clinical examination results were compared. The results show that those in the top 25%, who have many favorable living habits, had less total energy intake but higher intake of calcium and vitamins A, B1 and C than those in the lower categories (Table 4). As to consumption by food group, the top group consumed more legumes, pulses, fruit, green yellow vegetables and milk products, and a lesser amount of non-alcoholic drinks (beverages, others) than other groups (Table 5). Also, physical examination results showed that the top group had less γ -GTP, neutral fat, blood sugar when fasting, and HbA1c than other groups. The group with a large number of favorable living habits, therefore, had a desirable nutrient intake and showed excellent physical examination results

(I. Yoshita *et al.* 2001).

Comparison of Japanese Middle-Aged Men's Nutrient and Energy Intake with Overseas Examples

A great deal of research has been conducted domestically concerning the nutrient and energy intake of middle-aged men. No epidemiological nutrition surveys, however, have been conducted using common protocols with strict controls to ensure a level of accuracy that would allow valid comparisons with international data.

In response to this situation, Stamler *et al.* conducted highly accurate dietary surveys (between 1997 and 1999) in Japan, China, the United Kingdom and the United States as part of an international collaborative study (INTERMAP Study) to clarify the relationship between nutrient intake and

Table 5. Dietary intakes for food groups in the three groups according to total score of healthy life status (g/day)

	Group L (n = 264)	Group M (n = 821)	Group H (n = 253)	L-M	L-H	M-H
Cereals	549.9 ± 158.1	563.5 ± 138.1	572.5 ± 133.9			
Nuts and Seeds	1.3 ± 4.5	1.4 ± 4.3	1.6 ± 6.2			
Potatoes	43.5 ± 45.0	46.7 ± 36.5	49.8 ± 36.3			
Sugars	7.5 ± 7.0	7.6 ± 6.8	7.6 ± 7.2			
Confectioneries	11.7 ± 21.3	10.8 ± 21.3	11.7 ± 23.0			
Fats and Oils	17.3 ± 10.5	17.7 ± 9.9	17.6 ± 10.2			
Pulses	73.3 ± 55.7	80.0 ± 57.4	86.2 ± 57.2		*	
Fruits	57.5 ± 106.8	92.3 ± 93.8	109.2 ± 102.4		**	
Green yellow Vegetables	67.3 ± 60.3	77.5 ± 59.3	96.4 ± 77.9		**	**
Vegetables, others	151.9 ± 82.3	162.8 ± 75.4	162.5 ± 64.5			
Fungi	7.7 ± 11.9	10.0 ± 14.8	10.1 ± 12.0			
Algae	4.9 ± 7.9	6.3 ± 11.5	6.2 ± 10.9			
Soy-sauces	21.0 ± 9.7	21.6 ± 9.9	20.8 ± 9.6			
Sauces, others	3.6 ± 5.1	3.5 ± 5.2	2.9 ± 4.2			
Salts	1.7 ± 1.1	1.7 ± 1.1	1.7 ± 1.0			
Seasoning, others	10.4 ± 9.9	10.2 ± 9.0	11.1 ± 8.9			
Sake	99.1 ± 151.1	64.5 ± 117.7	29.5 ± 69.6	-	-	-
Beer	385.7 ± 450.2	247.2 ± 331.0	181.3 ± 226.9	-	-	-
Alcoholic beverages, others	29.7 ± 69.0	19.8 ± 60.6	10.5 ± 32.4	-	-	-
Beverages, others	398.5 ± 305.1	332.4 ± 249.5	308.5 ± 298.5	**	**	
Fishes and Shellfishes	119.8 ± 68.6	109.5 ± 67.3	106.5 ± 57.3			
Meats	77.3 ± 53.6	74.2 ± 47.1	69.1 ± 43.2			
Eggs	34.2 ± 24.8	35.4 ± 25.4	35.2 ± 23.9			
Milk products	108.8 ± 113.1	131.1 ± 117.6	158.2 ± 123.6	*	**	**
Others	6.7 ± 30.7	5.0 ± 18.7	4.0 ± 13.9			

Mean ± Standard Deviation

Group L : Group with total score 0 to 3 points

Group H : Group with total score 6 to 7 points

* : p < 0.05, ** : p < 0.01, Significant Difference

Group M : Group with total score 4 to 5 points

blood pressure. This survey was conducted over four days using a 24-hour recall method with men and women between the ages of 40 and 59 (Stamler *et al.* 2003). Among the survey's results, physical condition and average intake of nutrients and energy for men in the four countries are shown in

Table 6, 7 (Zhou *et al.* 2003).

According to these results, Japanese men's cholesterol intake was the highest and their dietary fiber intake was the lowest among the four countries. Also, the alcohol energy ratio (alcohol-originated energy included in total energy in-

Table 6. Intake of energy, macronutrients, cholesterol, fiber, alcohol

	Japan (n = 547)	P.R.China (n = 416)	U.K. (n = 266)	U.S. (n = 1,103)
Age-years	49.5 ± 5.3	48.1 ± 6.0	49.6 ± 5.6	49.0 ± 5.4
Education-years	12.4 ± 2.1	6.5 ± 2.4	13.1 ± 3.2	15.4 ± 3.1
Body Mass Index-kg/m ²	23.7 ± 2.7	22.4 ± 2.7	27.7 ± 3.9	29.1 ± 5.1
Energy, kcal/day	2,278 ± 428	2,347 ± 532	2,470 ± 635	2,609 ± 694
Total Protein, %kcal	15.8 ± 2.3	12.6 ± 2.0	15.6 ± 3.2	15.5 ± 3.2
Animal Protein, %kcal	8.9 ± 2.5	2.8 ± 2.6	9.5 ± 3.4	10.2 ± 3.3
Vegetable Protein, %kcal	6.9 ± 1.1	9.8 ± 1.4	6.1 ± 1.4	5.0 ± 1.5
Total Fat, %kcal	23.7 ± 4.8	20.5 ± 6.2	33.0 ± 6.5	33.3 ± 6.7
SFA, %kcal	6.1 ± 1.6	5.2 ± 2.0	12.0 ± 3.4	10.8 ± 2.8
MFA, %kcal	8.6 ± 2.1	8.3 ± 2.8	11.2 ± 2.5	12.4 ± 2.8
PFA, %kcal	6.2 ± 1.5	5.9 ± 2.2	6.4 ± 1.9	7.0 ± 2.2
n-3 PFA, %kcal	1.3 ± 0.4	0.6 ± 0.4	0.7 ± 0.3	0.7 ± 0.3
n-6 PFA, %kcal	4.8 ± 1.3	5.4 ± 2.2	5.6 ± 1.8	6.3 ± 2.1
Trans FA, %kcal	0.3 ± 0.2	0.1 ± 0.4	1.6 ± 4.1	2.0 ± 0.8
Cholesterol, mg/day	446 ± 175	218 ± 201	299 ± 145	348 ± 176
Cholesterol, mg/1000kcal	195 ± 67	94 ± 86	120 ± 48	133 ± 59
Keys Dietary Lipid Score	28.7 ± 5.9	18.8 ± 10.2	39.9 ± 11.3	36.9 ± 9.7
PFA/SFA	1.1 ± 0.3	1.3 ± 0.6	0.6 ± 0.3	0.7 ± 0.3
Total Available Carb., %kcal	52.3 ± 7.7	61.8 ± 11.5	46.6 ± 7.2	48.4 ± 8.1
Starch, %kcal	35.5 ± 8.0	54.3 ± 11.5	25.8 ± 5.3	22.5 ± 5.7
Total Fiber, g/day	15.5 ± 4.8	30.5 ± 9.9	29.1 ± 9.8	21.5 ± 8.5
Estimated Total Sugars, %kcal	15.8 ± 3.9	7.1 ± 4.6	17.9 ± 5.2	24.3 ± 8.0
Alcohol, %kcal	8.2 ± 7.2	5.1 ± 8.0	4.7 ± 6.1	2.7 ± 4.8

Mean ± Standard Deviaton

Table 7. Intake of minerals and vitamins

	Japan (n = 547)	P.R.China (n = 416)	U.K. (n = 266)	U.S. (n = 1,103)
Urinary Na, mg/day	4,843 ± 1,302	5,633 ± 2,454	3,702 ± 1,180	4,202 ± 1,436
Urinary K, mg/day	1,920 ± 519	1,506 ± 506	2,912 ± 852	2,512 ± 839
Dietary Ca, mg/day	605 ± 224	356 ± 150	1,013 ± 354	882 ± 402
Dietary Mg, mg/day	288 ± 68	348 ± 117	360 ± 97	364 ± 115
Dietary Fe, mg/day	11.4 ± 3.0	18.4 ± 5.9	14.8 ± 4.4	19.4 ± 7.8
Dietary Se, mg/day	191 ± 79	40 ± 14	110 ± 41	153 ± 78
Dietary P, mg/day	1,232 ± 285	1,000 ± 306	1,556 ± 439	1,488 ± 454
β-Carotene, mcg/day	2,859 ± 1,918	2,667 ± 2,229	2,375 ± 1,899	4,025 ± 3,754
Retinol, mcg/day	427 ± 899	125 ± 215	553 ± 542	510 ± 581
Vitamin A, IU/day	6,187 ± 4,284	4,865 ± 3,796	5,801 ± 3,654	8,420 ± 6,641
Vitamin C, mg/day	126 ± 81	80 ± 41	87 ± 56	121 ± 85
Vitamin E, mg/day*	10.4 ± 3.0	12.4 ± 5.0	11.2 ± 5.1	11.4 ± 5.4

Mean ± Standard Deviaton

*Alpha-tocopherol equivalents (ATE).

take) exceeded 8%, the highest among the four countries (Table 6). While for Japanese men, the intake of magnesium and iron was the lowest, their vitamin C intake was the highest (Table 7).

Consumption by food group and nutrient intake by food group in the four countries will be further elucidated as the study continues and additional detailed examinations will be conducted including the levels of nutrients consumed and nutrition ratios. Based on the available results, however, it is obvious that Japanese middle-aged men must guard against consuming excessive amounts of high cholesterol foods and alcohol, and ensure that their mineral intake is adequate.

Conclusion

This report raises and clarifies several issues concerning Japanese middle-aged men's intake of nutrients and energy, and has made available some of the data generated in studies where nutrient intake in several countries was compared.

In Japan, the money spent on medical care is consistently breaking previous records each year and the burden this places on the government and the people is increasing. The number of elderly people in need of nursing care due to a variety of diseases is also increasing rapidly and this is now becoming a pressing social issue.

In order to deal with these issues from a nutritional perspective, it is imperative to improve daily eating habits and related living practices so that appropriate nutrients will be consumed on a regular basis. It is, however, often difficult and takes time to improve entrenched and problematic habits. Also, people often fail to deal effectively with problems when left to their own resources. It is, therefore, necessary to enhance nutrition-related educational opportunities for middle-aged men in a range of areas and to improve nutritional and dietary environments at home, and in the community or workplaces that these men live and work in.

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