Food Intake and Food Consumption Patterns of Hospital Workers in the Dominican Republic

Isao SAITO^{*1}, Hideki OZAWA^{*1}, Mercedes CASTRO Bello^{*2}, Chinatsu MORIWAKI^{*3}, Morio ITO^{*4}
Hiroshi AONO^{*1}, Toshiko IKEBE^{*1}, Akira MIYATA^{*5} and Takashi ITOGA^{*6}

^{*1} Department of Public Health and Hygiene, Oita Medical University, Oita

^{*2} Division of Epidemiology, Center of Gastroenterology, Dr. Luis E. Aybar Hospital, Santo Domingo

^{*3} Department of Food and Nutrition, Beppu University Junior College, Beppu

^{*4} Department of Laboratory medicine, Oita Medical University, Oita

^{*5} Department of Biology, Oita Medical University, Oita

^{*6} Department of Internal Medicine, Oita Medical University, Oita

Abstract

Coronary heart disease (CHD) is the leading cause of death according to official mortality statistics in the Dominican Republic. The purpose of this study was to assess food intake and food consumption patterns of Dominicans and to discuss CHD risks related to nutrient intake.

The subjects were 22 men and 81 women voluntarily recruited among 230 hospital workers in Santo Domingo. The mean nutrient intake and food consumption were estimated from a single 24-hour recall method administered by trained persons who elicited each subject's previous day's intake from midnight to midnight. The mean energy intake was 2030 kcal. The mean intake of total protein, total fat and carbohydrates were 66.3g, 89.1g and 248g, respectively. Percentage of energy from total fat was 39.5%, which was higher than WHO recommendations. But, the percentage of animal fat per total fat was 46.8%. Especially, the value in the low income group was 31.7%. Moreover, we analyzed the food consumption structure in order to understand the Dominican dietary pattern, and three factors were found to explain the characteristics on the basis of factor analysis.

The low percentage of animal fat was due to the diets rich in vegetable oil. Our results suggested that it was difficult to assume that CHD risks increased as a result of the Dominican dietary pattern. This was consistent with our previous findings that the average serum cholesterol level of Dominicans was generally low.

Key words: The Dominican Republic, Nutrition, Coronary heart disease, 24-hour recall method, Percentage of energy from total fat

Introduction

A striking change in developing countries has been the rapid increase in the proportion of people living in urban areas¹⁾. The change has had an impact upon dietary behaviors and the development of chronic non-infectious diseases, including particularly, coronary heart disease (CHD), cerebrovascular disease, various cancers and diabetes mellitus. This growing urban population tends to adopt diets containing more animal

products, fat and sugar, and the consequences for their health may often be detrimental. Urban populations in Latin America have patterns of mortality which are very similar to those of Europe and North America. These patterns show that the leading causes of death after childhood in these developing countries are cardiovascular diseases and cancers¹⁾.

The Dominican Republic is located between the Atlantic Ocean and the Caribbean Sea with a population of about 7,500,000. It is a developing country, dependent on agricultural products and the export of raw materials. Mortality statistics in the Dominican Republic show that CHD was the second highest cause of death at a rate of 21 per 100,000 per year in 1992²⁾. We examined major coronary risk factors of Dominican adults, and showed that these risks were lower compared with those of the Japanese with a low CHD rate³⁾.

Epidemiological studies in Europe and North America have

Reprint requests to: Isao Saito,
Department of Public Health and Hygiene, Oita Medical University,
Idaigaoka, Hasama-machi, Oita 879-5593, Japan
TEL: +81(975)86-5732,
FAX: +81(975)86-5739
e-mail:saitoi@oita-med.ac.jp

reported the association between diet and CHD⁴⁻⁷). If CHD deaths are to be recognized as mortality statistics stated, there might be some factors increasing CHD risks related to a Dominican nutrient intake. In addition, it is necessary to understand food intake and food consumption patterns for the evaluation of CHD risks.

Subjects and Methods

The subjects were 22 men and 81 women voluntarily recruited among 230 hospital workers of a medical center for gastroenterology in Santo Domingo, the capital of the Dominican Republic. These subjects included doctors, nurses, technicians, office and manual workers. Table 1 shows the characteristics of the subjects. Income groups were classified into three groups based on individual income responses. These groups were defined, as proposed by a Dominican epidemiologist, as less than 2,000 pesos monthly in the low income group, 2,000 to 4,000 pesos in the middle

income group, and 4,000 pesos and over in the high income group. The average monthly income of all hospital workers is 4,600 pesos. This average is very high compared with ordinary income of about 2,000 pesos. Half of the subjects were in the high income group. Both height and weight of each subject were measured. Obesity was defined as a BMI (Body Mass Index) value 27.8 Kg/m² and over for men, and 27.3 Kg/m² and over for women according to the United States NIH criteria. The prevalence of obesity was 26.2%.

The mean nutrient intake and food consumption presented in this paper were estimated from a single 24-hour recall method⁸). This method was administered by trained persons who elicited each subject's previous day's intake from midnight to midnight on weekdays. 64 foods among 17 food groups were collected by Dominican nutritionists as ordinary Dominican foods. Food portion sizes were quantified using their photographs. The nutrient composition of foods was calculated using a Dominican food table⁹). In addition, frequencies of dietary intake were examined and classified into four categories; almost daily, three or four times a week, once or twice a week, and seldom.

Food articles derived from this survey were classified into 14 food groups; cereals, potatoes, sugar & preserves, fats & oils, pulses, fruit, vegetables, fish, meat & meat products, eggs, milk, dairy products, confectioneries, and beverages. Another three food groups of fungi, algae and prepared foods were excluded from the analysis because the food consumption was very rare. Platano, a type of banana often fried or boiled, is a typical Dominican food which is included in the potatoes food group. We analyzed a "food consumption structure" proposed by Toyokawa¹⁰), which examined the interrelationship between food groups calculated by Spearman's correlation coefficient. Dietary patterns were determined by factor analysis using the variables of an individual day's intake of these 14 food groups. The first, second and third factors were chosen from this analysis. We interpreted the meaning of these factors after Varimax rotation in order to understand the daily dietary patterns.

Results

Tables 2 and 3 show nutrient intake and food consumption

Table 1 Characteristics of the subjects.

Variables	Category	n	%
Sex	Men	22	21.4
	Women	81	78.6
Age (y)	< 30	29	28.2
	30 - 39	47	45.6
	40 - 49	22	21.4
	50 -	5	4.9
Income group ^a	Low	21	20.4
	Middle	30	29.1
	High	52	50.5
Marriage	Married	48	46.6
	Single	52	50.5
	Cohabitation	3	2.9
Obesity ^b	Obese	27	26.2

^a Definition : Low (less than 2,000 pesos monthly), Middle (2,000 to 4,000 pesos), High (4,000 pesos and over)

^b Obesity was defined as a BMI value 27.8 kg/m² and over for men, and 27.3 kg/m² and over for women according to the United States NIH criteria.

Table 2 Mean level ($\pm$ standard deviation) of specified nutrients by sex.

	Men n = 22	Women n = 81	Total n = 103
Energy (kcal)	2102 $\pm$ 570	2010 $\pm$ 709	2030 $\pm$ 680
Total protein (g)	70.6 $\pm$ 31.1	65.1 $\pm$ 27.6	66.3 $\pm$ 28.3
Animal protein (g)	46.3 $\pm$ 25.6	42.1 $\pm$ 22.9	43.0 $\pm$ 23.5
Total fat (g)	93.2 $\pm$ 40.7	88.8 $\pm$ 41.4	89.1 $\pm$ 41.1
Animal fat ^a (g)	44.1 $\pm$ 30.2	42.3 $\pm$ 30.9	42.7 $\pm$ 30.6
Carbohydrates (g)	251 $\pm$ 79	247 $\pm$ 109	248 $\pm$ 103
Percentage of			
Animal protein	62.8 $\pm$ 14.2	61.7 $\pm$ 17.8	61.9 $\pm$ 17.0
Animal fat ^a	46.6 $\pm$ 24.5	46.8 $\pm$ 23.0	46.8 $\pm$ 25.3
Percentage of energy from			
Protein	13.1 $\pm$ 3.6	13.0 $\pm$ 3.6	13.0 $\pm$ 3.6
Total fat	39.1 $\pm$ 11.9	39.9 $\pm$ 11.2	39.5 $\pm$ 11.5
Carbohydrates	49.1 $\pm$ 12.7	48.5 $\pm$ 11.2	48.6 $\pm$ 11.5

^a Animal fat dose not include fat derived from fish.

Table 3 Mean level ($\pm$ standard deviation) of food consumption by sex (grams / person and day).

Food groups	Men n = 22	Women n = 81	Total n = 103
Cereals	221 $\pm$ 140	222 $\pm$ 143	222 $\pm$ 142
Potatoes ^a (Platano)	345 $\pm$ 342 (144 $\pm$ 178)	246 $\pm$ 250 (115 $\pm$ 187)	267 $\pm$ 273 (121 $\pm$ 184)
Sugar & preserves	22 $\pm$ 25	25 $\pm$ 26	25 $\pm$ 26
Fats & oils	32 $\pm$ 23	29 $\pm$ 21	30 $\pm$ 21
Pulses	24 $\pm$ 24	25 $\pm$ 26	25 $\pm$ 26
Fruit	143 $\pm$ 191	314 $\pm$ 356	277 $\pm$ 334
Vegetables	60 $\pm$ 77	100 $\pm$ 122	91 $\pm$ 115
Fish	22 $\pm$ 46	13 $\pm$ 34	15 $\pm$ 37
Meat & meat products	106 $\pm$ 79	114 $\pm$ 99	112 $\pm$ 95
Eggs	18 $\pm$ 35	19 $\pm$ 45	18 $\pm$ 43
Milk	161 $\pm$ 200	119 $\pm$ 147	128 $\pm$ 159
Dairy products	81 $\pm$ 143	41 $\pm$ 64	50 $\pm$ 88
Confectioneries	5 $\pm$ 9	11 $\pm$ 21	10 $\pm$ 19
Beverages	33 $\pm$ 93	50 $\pm$ 93	46 $\pm$ 93

^a Potatoes include an intake of Platano which is separately in below parentheses.

of food groups by sex. The mean energy intake was 2030 kcal. The mean intake of total protein, total fat and carbohydrates were 66.3g, 89.1g, and 248g, respectively. The percentage of energy from total fat was 39.5%, and that from carbohydrates was 48.6%. Those from animal protein and fat were 61.9% and 46.8%. There were no differences in the nutrient intake between men and women (Table 2). There was a relatively large consumption of cereals, potatoes, fruit, meat & meat products, and milk. In contrast, the consumption of fish, eggs and confectioneries was less (Table 3). Tables 4 and 5 show the nutrient intake and the food consumption classified into income groups. The intake of animal protein and total fat, and the percentage of animal fat were significantly different among income groups by one-way analysis of variance (ANOVA) (Table 4). The consumption of meat & meat products, fruit, milk, and dairy products tended to

be low in the low income group (Table 5).

Fig. 1 shows frequencies of dietary intake of main food groups. High frequencies of dietary intake included rice, pulses, meat, and milk & dairy products. Around 60% of the subjects listed them in the almost daily category. About 30% of them grouped potatoes, platano, and eggs in the three to four times a week category. Fish was rarely eaten, and 70% of them answered in the seldom category.

Table 6 shows a correlation matrix among 14 food groups to understand the food consumption structure proposed by Toyokawa¹⁰. The following pairs of food groups were synergistic: cereals and fats & oils, cereals and pulses, sugar & preserves and fruit, sugar & preserves and milk, fats & oils and vegetables, pulses and fish, fruit and dairy products, and milk and confectioneries. On the other hand, the followings were antagonistic: sugar &

Table 4 Mean level ($\pm$ standard deviation) of specified nutrients by income groups.

	Income group ^a			P value ^b
	Low n = 21	Middle n = 30	High n = 52	
Energy (kcal)	1844 $\pm$ 537	2162 $\pm$ 719	2028 $\pm$ 703	NS
Total protein (g)	57.3 $\pm$ 23.6	73.1 $\pm$ 30.4	66.0 $\pm$ 28.3	NS
Animal protein (g)	33.2 $\pm$ 18.9	49.6 $\pm$ 24.3	43.2 $\pm$ 23.6	< 0.05
Total fat (g)	75.0 $\pm$ 24.9	92.8 $\pm$ 35.1	92.7 $\pm$ 48.3	NS
Animal fat ^c (g)	26.0 $\pm$ 20.8	50.3 $\pm$ 31.0	45.0 $\pm$ 31.6	< 0.05
Carbohydrates (g)	243 $\pm$ 83	260 $\pm$ 111	243 $\pm$ 107	NS
Percentage of				
Animal protein	55.0 $\pm$ 17.0	66.2 $\pm$ 15.6	62.3 $\pm$ 17.3	NS
Animal fat ^c	31.7 $\pm$ 18.5	53.6 $\pm$ 23.2	48.9 $\pm$ 26.8	< 0.01
Percentage of energy from				
Protein	12.3 $\pm$ 3.1	13.4 $\pm$ 3.3	13.1 $\pm$ 3.9	NS
Total fat	37.3 $\pm$ 9.3	39.6 $\pm$ 11.5	40.4 $\pm$ 12.4	NS
Carbohydrates	52.1 $\pm$ 9.7	47.3 $\pm$ 10.7	48.0 $\pm$ 12.5	NS

^a Definition : Low (less than 2,000 pesos monthly), Middle (2,000 to 4,000 pesos), High (4,000 pesos and over)

^b P value was computed by one-way analysis of variance. NS : not significant

^c Animal fat does not include fat derived from fish.

Table 5 Mean level ($\pm$ standard deviation) of food consumption by income groups (grams / person and day).

Food groups	Income group ^a		
	Low n = 21	Middle n = 30	High n = 52
Cereals	288 $\pm$ 127	206 $\pm$ 141	204 $\pm$ 142
Potatoes ^b	223 $\pm$ 237	283 $\pm$ 264	276 $\pm$ 294
(Platano)	(112 $\pm$ 184)	(112 $\pm$ 202)	(131 $\pm$ 177)
Sugar & preserves	18 $\pm$ 16	22 $\pm$ 22	28 $\pm$ 30
Fats & oils	28 $\pm$ 15	26 $\pm$ 19	33 $\pm$ 25
Pulses	27 $\pm$ 32	22 $\pm$ 20	25 $\pm$ 26
Fruit	157 $\pm$ 237	392 $\pm$ 375	260 $\pm$ 327
Vegetables	77 $\pm$ 70	99 $\pm$ 166	93 $\pm$ 93
Fish	9 $\pm$ 24	16 $\pm$ 40	17 $\pm$ 40
Meat & meat products	92 $\pm$ 55	139 $\pm$ 89	105 $\pm$ 108
Eggs	24 $\pm$ 48	20 $\pm$ 30	15 $\pm$ 47
Milk	91 $\pm$ 110	136 $\pm$ 175	139 $\pm$ 167
Dairy products	16 $\pm$ 31	73 $\pm$ 116	50 $\pm$ 81
Confectioneries	11 $\pm$ 20	8 $\pm$ 20	10 $\pm$ 19
Beverages	39 $\pm$ 105	25 $\pm$ 45	61 $\pm$ 105

^a Definition : Low (less than 2,000 pesos monthly), Middle (2,000 to 4,000 pesos), High (4,000 pesos and over)

^b Potatoes include an intake of Platano which is separately below in parentheses.

Table 6 Correlation matrix of food consumption based on each food group.

Food groups	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1. Cereals	1.000													
2. Potatoes	-0.170	1.000												
3. Sugar & preserves	-0.150	0.019	1.000											
4. Fats & oils	0.229*	-0.070	-0.112	1.000										
5. Pulses	0.269**	-0.059	-0.041	0.181	1.000									
6. Fruit	-0.099	0.080	0.473***	-0.217*	-0.064	1.000								
7. Vegetables	0.125	-0.069	0.107	0.275**	0.158	0.124	1.000							
8. Fish	-0.149	0.156	-0.081	0.019	0.245*	0.038	-0.031	1.000						
9. Meat & meat products	0.113	0.080	-0.198*	-0.045	0.076	-0.040	0.045	-0.175	1.000					
10. Eggs	0.094	0.101	-0.126	-0.069	-0.170	-0.095	-0.055	-0.196*	-0.045	1.000				
11. Milk	-0.076	0.028	0.236*	-0.098	-0.094	-0.014	-0.008	-0.102	-0.065	0.048	1.000			
12. Dairy products	0.160	-0.016	0.067	-0.118	-0.002	0.194*	-0.111	-0.087	0.041	0.021	0.138	1.000		
13. Confectioneries	-0.153	-0.069	0.186	-0.054	-0.136	0.075	0.040	-0.184	-0.147	0.015	0.253*	0.097	1.000	
14. Beverages	-0.111	-0.014	0.155	0.048	0.043	-0.132	0.072	0.004	-0.012	-0.082	0.025	-0.064	-0.033	1.000

*, p < 0.05, **, p < 0.01, ***, p < 0.001

Table 7 Factor loading of each food group by factor analysis.

Food groups	1st factor	2nd factor	3rd factor
Cereals	0.351	-0.047	-0.104
Potatoes*	-0.098	0.004	0.449
Sugar & preserves	-0.030	0.432	-0.184
Fats & oils	0.337	0.053	-0.142
Pulses	0.345	-0.013	0.090
Fruit	-0.087	0.426	0.114
Vegetables	0.127	0.385	0.224
Fish	0.128	-0.011	-0.060
Meat & meat products	0.117	0.011	0.473
Eggs	-0.223	-0.284	0.197
Milk	-0.053	0.100	-0.196
Dairy products	0.172	-0.014	-0.048
Confectioneries	-0.298	0.015	-0.086
Beverages	0.090	0.079	-0.165
Eigen value	1.902	1.658	1.427
Percentage of contribution (%)	13.6	11.8	10.2
Cumulative percentage (%)	13.6	25.4	35.6

* Potatoes include an intake of Platano.

Fig.1 Frequencies of dietary intake by main food groups.

Fig.2 Two-dimensional spatial diagram of food consumption.

preserves and meat & meat products, fats & oils and fruit, and fish and eggs. Factor analysis was performed to comprehend each subject's dietary pattern. Table 7 shows the factor loading of each food group. In addition, Fig. 2 presents a two-dimensional spatial diagram of food consumption plotting the factor loading on the horizontal and vertical axes. The percentage of contribution of the first factor was 13.6%, that of the second was 11.8%, and that of the third was 10.2%. The cumulative percentage through the three factors was 35.6%. Cereals, pulses, and fats & oils were positively high in the first factor loading, while confectioneries, eggs, and potatoes were negatively high. So, the meaning of the first factor was interpreted as "staple diets." In the same way, in the second factor, fruit, sugar & preserves, and vegetables typically showed positive high loading. This factor was done as "diets for supplying carbohydrates." The third factor loading of meat & meat products and potatoes was high, which was regarded as "main dishes."

Discussion

The purpose of this nutrition survey was to assess food intake and food consumption patterns of Dominicans and to discuss

CHD risks related to nutrient intake. A single 24-hour recall method was performed in the present study. This method has been commonly used in epidemiological studies to assess the average intake of a group^{8,10}. Our subjects were selected among hospital workers. Most of them had more than 2,000 pesos monthly income which was relatively high. Our results can't be generalized because a person having a job with a monthly salary was better than average in this country, and our subjects, who were hospital workers, were more conscientious of their own health than ordinary people. Moreover, validity and reliability studies of this nutrition method were not done. It is necessary to observe our results carefully with regard to the bias results from the subjects and the method. But, since there are few reports on Dominican adults, our results are useful to comprehend the outline of their food intake and dietary patterns.

The percentage of energy in developing countries where cereals and potatoes are principle foods tends to be dependent on carbohydrates. Calculated from the food balance sheet published by FAO¹², the percentage of energy from carbohydrates was 65% in Brazil, 70% in Egypt, and 75% in Thailand, while that from total fat or protein was lower. On the contrary, our results showed that 48.6% of energy from carbohydrates was lower and

39.5% of energy from total fat was higher in comparison with these countries. These percentages were similar to those from the Hispanic Health and Nutrition Examination Survey (HHANES) in 1982 through 1984¹³⁾, which was a nutrition survey done on Hispanic Americans. It was reported that dietary behaviors in Latin America or the Caribbean were affected by American diets¹⁴⁾. The consequences appeared to show diets which increasingly contained more fat and animal products, thus our results were thought to be close to that of HHANES in the last decade.

In Dominican diets the percentage of energy from total fat ranged from 37% to 40% in all income groups. This percentage was similar to that of Europeans and Americans. That of animal fat per total fat, however, was distinctly low. There were significant differences among income groups, and, especially, the percentage in the low income group was 31.7%. Although the percentage of energy from total fat was high, the ratio, indicating a comparatively high level of vegetable fat component, was distinguished from that of Europeans and Americans and was similar to that of the Japanese, which was 39%¹⁵⁾.

We analyzed the food consumption structure proposed by Toyokawa¹⁰⁾ in order to understand the Dominican dietary pattern. Three factors were found to explain the characteristics on the basis of factor analysis. Cereals, pulses and fats & oils could be regarded as "staple diets" by the first factor. Rice, which was a main food in the cereals group, and pulses were the most frequently eaten foods as shown in Fig. 1. Cereals and fats & oils, cereals and pulses had synergistic relationships. An increase in the intake of cereals was positively related to that of pulses and fats & oils. These relationships resulted from cereals cooked with a lot of vegetable oil, such as corn or soybean oil. Accordingly, the high percentage of energy from total fat may be due to these diets rich in vegetable oil. For example, there are traditional dishes using rice, called "white rice" or "rice with red beans," in which vegetable oils are usually added when cooked. The second factor could be surmised as an indicator of "diets for supplying carbohydrates" such as fruit, sugar & preserves, and vegetables. Sugar & preserves were synergistic to fruit and milk. A few spoons of sugar are often used when Dominicans have fruit juice or milk, which supply various kinds of vitamins. The third factor was represented as "main dishes" by meat & meat products and potatoes. Although the cumulative percentage through the three factors was 35.6%, these three factors characterized Dominican dietary patterns well.

CHD is the leading cause of death according to official mortality statistics in the Dominican Republic²⁾. In order to verify the statistics, we examined major coronary risk factors of Dominican adults and Dominican death certificates. Aono et al.³⁾ showed that the average total cholesterol level of Dominicans was about 20 mg/dl lower than that of the Japanese. The prevalence

of hypertension and the smoking rate were also lower compared with the Japanese with a low CHD rate. Furthermore, the death certificates of patients with circulatory diseases were examined in a rural area with a population of 100,000 in this country¹⁷⁾. This examination showed there were many cases that medical doctors certified based on the information from families when patients died out of hospital. This fact suggested that the evidence of CHD diagnosis was very poor.

Many epidemiological studies have proven that CHD mortality increased according to the increase in the intake of total fat, saturated fatty acids, and cholesterol¹⁴⁻¹⁷⁾. WHO recommendations¹⁾ for the prevention of CHD advocated an intake of total fat within the range of 15-30% of energy. The intake of saturated fatty acids was limited to 10% of energy. Our study presented 39.5% of energy from total fat, which was higher than the WHO recommendations. However, populations in some Mediterranean countries with a high intake of total fat (more than 40% of energy) derived from olive oil have a low rate of CHD¹⁸⁾. Eskimos, who also have a diet high in total fat and n-3 poly unsaturated fatty acids, mainly derived from marine foods, have also a low CHD rate¹⁹⁾. The diets of these populations are characterized by a low intake of saturated fatty acids²⁰⁾. We were unable to estimate the intake of saturated, unsaturated fatty acids, and cholesterol in this survey because these compositions were not shown in the Dominican food table⁹⁾ we used. However, the food consumption pattern characterized by the factor analysis mentioned above may not impact on increasing serum cholesterol.

In conclusion, it was difficult to assume that CHD risks increased in the Dominican dietary pattern. This was consistent with our previous findings that the average serum cholesterol level of Dominicans was generally low³⁾. However, our survey was limited in the method which was a single examination and the subjects who were hospital workers being conscious of their own health. Because of the limitations, we were unable to rule out the bias in order to understand the ordinary Dominican nutrient intake more accurately. Future epidemiological research is needed to clarify the intake among the general population in the Dominican Republic.

Acknowledgment

We thank Ms. Prisca, Dr. R. Baron and the project's Japanese staff for their assistance, and also Ms. M. E. Dalton for editing the manuscript. This survey was performed as one of the research projects in the "investigation and clinical treatment of gastroenterological diseases" in the Dominican Republic by the Japan International Cooperation Agency. This study was supported in part by a Grant-in Aid for International Scientific Research (Principal investigator H. Ozawa, University-to-University Cooperative Research) from the Ministry of Education, Science, Sports and Culture, Japan.

References

- 1) WHO study groups on diet, nutrition, and the prevention of chronic diseases. WHO Technical Report Series, No 797, Geneva: World Health Organization, 1990.
- 2) Secretaria de Estado de Salud Publica y Asistencia Social, Republica Dominicana. Memoria, 1993. (in Spanish)
- 3) Aono H, Ozawa H, Castro MB, Ito M, Saito I. Prevalence of risk factors for coronary heart disease among Dominicans in the Dominican Republic: comparison with Japanese and Americans using existing data. *J Epidemiol* 1997; 7: 238-43.
- 4) Ulbricht, TLV, Southgate DAT. Coronary heart disease: seven dietary factors. *Lancet* 1991; 338: 985-92.
- 5) Shekelle RB, Stamler J. Dietary cholesterol and ischaemic heart disease. *Lancet* 1989; 27: 1177-9.
- 6) McGee DL, Reed DM, Yano K, Kagan A, Tillotson J. Ten-year incidence of coronary heart disease in the Honolulu Heart Program. *Am J Epidemiol* 1984; 119: 667-76.
- 7) Kushi LH, Lew RA, Stare FJ, Ellison CR, Lozy M, Bourke G, Daly L, Graham I, Hickey N, Mulcahy R, Kevaney J. Diet and 20-year

- mortality from coronary heart disease: The Ireland-Boston Diet-heart study. *N Engl J Med* 1985; **312**: 811-8.
- 8) Kojima S, Takakuwa K. *Jyunkanki sikkkan no henbou: nihonjin no eiyo to seikatukankyo tono kanren*, Komachi Y, et al. Editor. Tokyo: Hoken Doujinsha Publishers, 1987: 546-58. (in Japanese)
 - 9) Secretaria de Estado de Salud Publica y Asitenica Social Division de Nutricion, Republica Dominicana. *Tabla de composicion de alimentos mas comunes en Republica Dominicana*, 1984. (in Spanish)
 - 10) Toyokawa H. Nutritional status in Japan from the viewpoint of numerical ecology. *Soc Sci Med* 1978; **12**: 517-24.
 - 11) Block G. A review of validations of dietary assessment methods. *Am J Epidemiol* 1982; **115**: 492-505.
 - 12) Food Balance Sheets, Food and Agriculture Organization of the United Nations. Rome: World Health Organization, 1992.
 - 13) Loria CM, Bush TL, Carroll MD, Looker AC, McDowell MA, Johnson CL, Semplos CT. Macronutrient intakes among adult Hispanics: A comparison of Mexican Americans, Cuban Americans, and Mainland Puerto Ricans. *Am J Public Health* 1995; **85**: 684-9.
 - 14) Dewey KG. Nutrition and the commoditization of food systems in Latin America and the Caribbean. *Soc Sci Med* 1989; **28**: 415-24.
 - 15) Health Promotion and Nutrition Div., Ministry of Health and Welfare. *National Nutrition Survey*, Japan, 1994. Tokyo: Daiichi Shuppan Publishers, 1996. (in Japanese)
 - 16) Verschuren WMM, Jacobs DR, Bloemberg BPM, Kromhout D, Menotti A, Aravanis C et al. Serum total cholesterol and long-term coronary heart disease mortality in different cultures: twenty-five-year follow-up of the seven countries study. *JAMA* 1995; **274**: 131-6.
 - 17) Saito I, Ozawa H, Aono H, Ito M. Examination of circulatory disease deaths based on the official death certificates in the Dominican Republic. *Jpn J Hyg* 1996; **51**(suppl.): 235.(in Japanese)
 - 18) Kushi LH, Lenart EB, Willett WC. Health implications of Mediterranean diets in light of contemporary knowledge. 2. meat, wine, fats, and oils. *Am J Clin Nutr* 1995; **61**(suppl.): 1416s-27s.
 - 19) Bang HO, Dyerberg J, Sinclair HM. The composition of the Eskimo food in north western Greenland. *Am J Clin Nutr* 1980; **33**: 2657-61.
 - 20) Leaf A, Weber PC. Cardiovascular effects of n-3 fatty acids. *N Engl J Med* 1988; **318**: 549-57.

(Received Oct.2, 1997/Accepted Dec.12, 1997)