結果

ADL 低下発生または死亡には関連がなかったが、表に示すように肉、魚、卵摂取頻度と ADL 低下発生には関連があった。

結論

当初の予想に反し魚、卵摂取頻度と ADL 低下発生には関連が無く、肉摂取頻度が比較的多い方が ADL 低下発生予防に寄与していた。比較的摂取量が少ないわが国においては肉摂取は蛋白摂取を増加させるとともに、社会経済状況が結果に関与したと想定される。

表　肉、魚、卵摂取頻度と19年間のADL低下発生の関係　N=1,889

	肉< 1/2 日	肉 ≥1/2 日	P	魚 < 1/日	魚 ≥1/日	P	卵< 1/日	卵 ≥1/日	P
N	775	1,114		1,073	816		1,221	668	
ADL低下発生例	41	34		39	36		51	24	
オッズ比									
年齢-性調整	1	0.58 (0.36-0.93)	0.02	1	1.19 (0.75-1.89)	0.47	1	0.86 (0.52-1.42)	0.55
モデル 1	1	0.61 (0.38-0.97)	0.04	1	1.25 (0.78-2.01)	0.35	1	0.89 (0.54-1.48)	0.66
モデル 2	1	0.62 (0.38-0.99)	0.05	1	1.23 (0.77-1.97)	0.39	1	0.90 (0.54-1.49)	0.67
モデル3	1	0.61 (0.38-0.99)	0.04	1	1.25 (0.76-1.95)	0.42	1	0.90 (0.54-1.49)	0.68

多変量ロジスティク解析結果。
モデル1：年齢、性、BMI、喫煙、飲酒、高血圧、糖尿病
モデル2：モデル1＋血清アルブミンおよび総コレステロール濃度
モデル3：モデル2＋職種（専門職か否か）、都市在住か否かに関して調整した。

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Dietary Habits in Middle Age and Future Changes in Activities of Daily Living – NIPPON DATA80

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Key Words
Meat · Fish · Egg · Activities of daily living · Mortality · Cohort study

Abstract
Background: Almost no studies have investigated the relationship between food intake measured at middle age and future disability. ***Objective:*** To examine the association of meat, fish and egg intake with risk of subsequent mortality and/or future decline in activities of daily living (ADL) among the elderly. ***Methods:*** The cohort consisted of 2,316 Japanese individuals aged 47–60 at the baseline who were randomly selected throughout Japan and followed up for 19 years from 1980. ***Results:*** Those who ate meat at least once every 2 days were younger, there were more men, daily drinkers, professional workers and urban residents compared to those who ate meat less than once every 2 days. Over 19 years of follow-up, 75 participants became dependent due to impaired ADL. A higher intake of meat was associated with a statistically significant decrease in impaired ADL occurrence (odds ratio = 0.61, 95% confidence intervals 0.38–0.99, p = 0.04). Fish and egg intake were not associated with any difference in impaired ADL occurrence. None of the 3 foods were associated with any changes in mortality. ***Conclusion:*** A higher intake of meat may prevent impaired ADL occurrence, although this was not associated with a lower mortality.

Introduction

The elderly population is increasing in developed countries and improvements in health care have led to an increase in life expectancy. In 2005, Japan had the highest proportion of those aged 65 and older in the world [1]. Although both life expectancy and healthy life expectan-

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cy in Japan are among the longest in the world, the difference in the 2 expectancies is about 7 years [2], indicating people in Japan suffer from the reduction in the activity of daily living (ADL) for a long time before death. Among many environmental factors that may influence ADL in the elderly, the role played by food is important. However, almost no studies have investigated the relationship between food intake measured at middle age and future disability.

The objective of this prospective study was to clarify the relationship between food intake and impaired ADL surveyed at 19 years after a baseline survey among a general Japanese population aged 47–59 years. Previous studies on food intake as well as all-cause and cause-specific mortality led us to hypothesize that food that is known to promote atherosclerosis, such as eggs or meat, would have a negative influence on future ADL, and food that is known to prevent atherosclerosis, such as fish, would have a beneficial influence on future ADL [3–9].

Methods

Subjects and Follow-Up

The dataset of the cohort study of the National Survey on Circulatory Disorders comprising the National Integrated Project for Prospective Observation of Non-Communicable Disease and Its Trends in the Aged (NIPPON DATA) was used. A baseline survey was performed in 1980 (NIPPON DATA80) [10–13]. We analyzed the 19-year follow-up data from the NIPPON DATA80 in this study.

The study population comprised 3,227 participants (1,413 men and 1,814 women, aged 47–59) from 300 randomly selected districts in 1980. The baseline surveys were carried out at local public health centers and all participants had to be capable of reaching the examination center without assistance. The participation rate was about 77%. We excluded 286 participants who had a history of coronary heart disease (CHD) or stroke (n = 39), had missing information in the baseline survey (n = 54) or were lost to follow-up (n = 193) due to an incomplete residential address at the baseline. Thus, 2,941 were eligible for follow-up. Among them, 427 died and information about ADL was gathered from 2,514 survivors by physicians and public health nurses at public health centers in 1999. Consequently, 75% (1,889) of the survivors completed the information. No potential differences between responders and nonresponders in terms of baseline age, gender, BP values, use of antihypertensive medication, body mass index (BMI), smoking status or serum albumin concentration were observed. Participants were asked about 5 basic ADL items (feeding, dressing, bathing, toileting and transfer: walking indoors) modified from Katz et al. [14], and whether each of these could be accomplished without help, with partial help or with full help. This survey was conducted through telephone interviews (10.5%), face-to-face interviews at home (80.0%) and other methods (9.5%). In this study, we basically analyzed participants who completed the ADL information alone (n = 1,889) and together with participants who died before the ADL survey (n = 2,316). The Institutional Review Board of Shiga University of Medical Science (No. 12-18, 2000) approved the study.

Biochemical and Baseline Examinations

Baseline BP was measured by trained observers using a standard mercury sphygmomanometer on the right arm of seated participants after at least 5 min of rest. Hypertension was defined as a systolic blood pressure ≥140 mm Hg, a diastolic blood pressure ≥90 mm Hg or when a participant was receiving medication for high blood pressure. BMI was calculated as weight (in kilograms) divided by squared height (in meters).

A lifestyle survey was also carried out using a self-administered questionnaire which included the daily consumption of meat, eggs and fish. Egg consumption was coded as ≥2 eggs per day, about 1 egg per day, about 1 egg every 2 days, about 1–2 eggs per week and <1 egg per week. Fish and meat intake were coded separately as ≥2 times per day, about once per day, about once every 2 days, about 1–2 times per week and less than once per week. Reported information was confirmed by public health nurses through interviews with the study participants regarding food consumption, smoking, drinking habit, and present and past medical histories.

Nonfasting blood samples were drawn and centrifuged within 60 min of collection and stored at –70°C until analyses. Serum total cholesterol, albumin, uric acid and creatinine were analyzed in a sequential auto-analyzer (SMA12/60; Technicon, Tarrytown, N.Y., USA) at a single laboratory (Osaka Medical Center for Health Science and Promotion). Serum concentrations of glucose were measured by the cupric-neocuproine method [15]. Diabetes was determined by medical history or defined as a serum glucose concentration ≥200 mg/dl.

Statistical Analysis

SAS version 9.1 for Windows (SAS Institute, Cary, N.C., USA) was used. Because the number of participants was not large, participants were classified into the 2 groups according to meat consumption as less than once every 2 days and at least once every 2 days, as well as fish and egg consumption as less than once per day and at least once per day around the median of these consumption categories. The χ^2 test was used to compare dichotomous variables and Student's t test was used to compare means between the 2 groups according to food consumption. The relationship between food intake categories and impaired ADL or impaired ADL together with all-cause mortality was calculated using multiple adjusted logistic regression models, taking a lower food consumption group as a reference. Age- and sex-adjusted as well as multivariate-adjusted odds ratios (OR) were calculated. For multivariate analyses, we adjusted for age, BMI and cigarette smoking (never and former smokers, current smokers <20 cigarettes/day, current smokers 20–40 cigarettes/day and current smokers ≥41 cigarettes/day), alcohol drinking (never, past, nondaily and daily), hypertension and diabetes (model 1). Model 1 was also adjusted for serum albumin and total cholesterol concentrations (model 2). Model 2 was further adjusted for job type (professional or not) and urban residence (yes or no; model 3). Interactions between sex and the effect of food intake on impaired ADL or impaired ADL together with all-cause mortality were examined.

Table 1. Baseline characteristics and outcomes of 1,042 male and 1,274 female participants in the meat, fish and egg intake groups, NIPPON DATA80, 1980–1999

	Meat		p	Fish		p	Egg		p
	<1/2 days	≥1/2 days		<1/day	≥1/day		<1/day	≥1/day	
Men									
Number	375	667		555	487		599	443	
Age, years	53.2 ± 3.6	52.9 ± 3.5	0.27	52.9 ± 3.5	53.1 ± 3.5	0.52	53.1 ± 3.5	52.9 ± 3.5	0.51
BMI	22.4 ± 2.9	22.7 ± 2.7	0.15	22.5 ± 2.9	22.7 ± 2.7	0.14	22.7 ± 2.8	22.4 ± 2.9	0.048
Smoking, %	69.9	65.4	0.13	68.5	65.3	0.28	66.9	67.0	0.97
Daily drinking, %	49.1	52.5	0.29	47.9	55.0	0.02	51.6	50.8	0.80
Hypertension, %	58.1	54.9	0.31	52.6	60.0	0.02	57.3	54.4	0.36
Diabetes, %	7.7	10.2	0.19	10.6	7.8	0.12	9.9	8.6	0.48
Albumin, mg/dl	4.4 ± 0.3	4.4 ± 0.2	0.48	4.4 ± 0.3	4.4 ± 0.2	0.47	4.4 ± 0.3	4.4 ± 0.3	0.95
TCH, mg/dl	186 ± 34	188 ± 34	0.49	188 ± 35	187 ± 33	0.53	189 ± 35	185 ± 32	0.10
Professional work, %	33.7	40.7	0.03	41.1	34.9	0.04	38.7	37.5	0.69
Urban residence, %	25.3	31.0	0.05	31.2	26.5	0.10	30.4	27.1	0.25
Incidence, %									
Death	25.1	25.5	0.88	25.2	25.5	0.93	25.2	25.5	0.91
Stroke	9.8	7.4	0.26	8.6	7.9	0.72	9.1	7.1	0.30
CHD	5.1	5.0	0.94	5.2	4.8	0.81	6.0	3.7	0.16
Leg fracture	1.5	2.1	0.54	1.7	2.0	0.80	2.3	1.2	0.29
Women									
Number	573	701		750	524		877	397	
Age, years	53.6 ± 3.8	53.1 ± 3.8	0.02	53.1 ± 3.7	53.5 ± 3.9	0.10	53.3 ± 3.8	53.3 ± 3.7	0.997
BMI	23.3 ± 3.6	23.3 ± 3.2	0.98	23.4 ± 3.4	23.2 ± 3.4	0.39	23.4 ± 3.4	23.2 ± 3.3	0.39
Smoking, %	9.8	6.0	0.01	8.8	6.1	0.08	7.8	7.6	0.90
Daily drinking, %	1.8	2.0	0.74	2.3	1.3	0.23	1.6	2.5	0.26
Hypertension, %	51.3	46.9	0.12	49.2	48.5	0.80	50.1	46.4	0.22
Diabetes, %	3.8	4.0	0.89	3.3	4.8	0.19	3.8	4.3	0.66
Albumin, mg/dl	4.4 ± 0.2	4.4 ± 0.2	0.67	4.4 ± 0.2	4.4 ± 0.2	0.80	4.4 ± 0.2	4.4 ± 0.2	0.71
TCH, mg/dl	196 ± 35	199 ± 32	0.20	197 ± 33	198 ± 33	0.73	196 ± 32	201 ± 35	0.01
Professional work, %	15.4	22.0	0.003	17.6	21.0	0.13	18.5	20.2	0.47
Urban residence, %	28.5	32.0	0.18	32.0	28.1	0.13	29.8	31.7	0.48
Incidence, %									
Death	13.8	12.0	0.34	12.3	13.6	0.50	11.9	14.9	0.14
Stroke	5.0	3.6	0.28	3.2	5.6	0.05	4.7	3.0	0.20
CHD	2.9	3.0	0.94	2.8	3.2	0.72	2.9	3.0	0.90
Leg fracture	0.8	1.8	0.16	1.7	0.9	0.26	0.9	2.4	0.05

Data are shown as percentages or means ± SD. TCH = Total cholesterol concentration.

Results

The baseline characteristics and outcomes of 1,413 male and 1,814 female study participants in each meat, fish and egg consumption category are shown in table 1. In male participants who ate meat at least once every 2 days, there were more professional workers compared to those who ate meat less than once every 2 days. In men who ate fish at least once per day, there were more daily drinkers and hypertension cases as well as fewer professional workers than in men who ate fish less than once per day. In men who ate eggs at least once per day, the mean BMI was smaller than in those who ate eggs less than once per day. In women who ate meat at least once every 2 days, there were more younger participants, more smokers and more professional workers compared to those who ate meat less than once every 2 days. In women who ate eggs at least once per day, the mean total cholesterol concentration was higher than in those who ate eggs less than once per day. No differences in crude out-

Table 2. Associations of impaired ADL or death and food intake in 2,316 participants in the meat, fish and egg intake groups, NIPPON DATA80, 1980–1999

	Meat		p	Fish		p	Egg		p
	<1/2 days	≥1/2 days		<1/day	≥1/day		<1/day	≥1/day	
Participants	948	1,368		1,305	1,011		1,476	840	
Cases with impaired ADL or death	214	288		271	231		306	196	
Odds ratio									
Age- and sex-adjusted	1	0.89 (0.72–1.09)	0.25	1	1.06 (0.86–1.30)	0.58	1	1.09 (0.88–1.34)	0.44
Model 1	1	0.91 (0.74–1.12)	0.35	1	1.09 (0.89–1.34)	0.40	1	1.10 (0.89–1.36)	0.40
Model 2	1	0.91 (0.74–1.12)	0.38	1	1.10 (0.89–1.35)	0.39	1	1.10 (0.89–1.36)	0.39
Model 3	1	0.91 (0.73–1.12)	0.36	1	1.08 (0.87–1.33)	0.50	1	1.09 (0.88–1.35)	0.43

During 19 years of follow-up, 502 participants either died or became dependent due to impaired ADL. Numbers of participants at risk and impaired ADL or death cases, age- and sex-adjusted as well as multivariate-adjusted (model 1–3) odds ratios (with 95% confidence intervals in parentheses) for death or impaired ADL are shown. Model 1 included age, sex, smoking (never and former smokers, current smokers <20, 20–40, and ≥41 cigarettes/day), alcohol drinking (never, past, nondaily, and daily), hypertension, diabetes and BMI. Model 2 included model 1 variables plus serum albumin and total cholesterol concentration. Model 3 included model 2 variables plus job type (professional or not) and urban residence.

Table 3. Associations of death and food intake in 2,316 participants in the meat, fish and egg intake groups, NIPPON DATA80, 1980–1999

	Meat		p	Fish		p	Egg		p
	<1/2 days	≥1/2 days		<1/day	≥1/day		<1/day	≥1/day	
Participants	948	1,368		1,305	1,011		1,476	840	
Cases with death	173	254		232	195		255	172	
Odds ratio									
Age- and sex-adjusted	1	0.98 (0.79–1.22)	0.87	1	1.03 (0.83–1.28)	0.79	1	1.14 (0.91–1.42)	0.26
Model 1	1	1.00 (0.80–1.25)	0.98	1	1.07 (0.86–1.33)	0.57	1	1.14 (0.91–1.43)	0.26
Model 2	1	1.00 (0.80–1.26)	0.96	1	1.07 (0.86–1.33)	0.55	1	1.14 (0.91–1.43)	0.26
Model 3	1	1.00 (0.80–1.25)	0.99	1	1.06 (0.84–1.32)	0.65	1	1.13 (0.90–1.42)	0.29

During 19 years of follow-up, 427 participants died. The numbers of participants at risk and death cases, age- and sex-adjusted as well as multivariate-adjusted (model 1–3) odds ratios (with 95% confidence intervals in parentheses) for death are shown. Model 1 included age, sex, smoking (never and former smokers, current smokers <20, 20–40, and ≥41 cigarettes/day), alcohol drinking (never, past, nondaily and daily), hypertension, diabetes and BMI. Model 2 included model 1 variables plus serum albumin and total cholesterol concentration. Model 3 included model 2 variables plus job type (professional or not) and urban residence.

comes (incidence of death, stroke, CHD or leg fracture) were noted between the 2 groups in each of the 3 food intake categories. The baseline characteristics and outcomes of the 1,889 surviving participants were basically as in table 1.

During 19 years of follow-up, 502 participants either died or became dependent due to impaired ADL. Table 2 shows the numbers of participants at risk and impaired ADL or death cases, OR and 95% confidence intervals by age- and sex-adjusted as well as multivariate-adjusted OR (model 1–3) for death or impaired ADL. Differences in any food intake were not associated with differences in composite outcome of impaired ADL and death. There was no interaction between sex and the effect of food intake on impaired ADL together with all-cause mortality.

During 19 years of follow-up, 427 participants died. Table 3 shows the numbers of participants at risk and death cases, OR and 95% confidence intervals by age- and sex-adjusted as well as multivariate-adjusted OR (model 1–3) for death. Differences in any food intake were not associated with differences in mortality. There were no interactions between sex and the effect of food intake on all-cause mortality.

Table 4. Associations of impaired ADL and food intake in 1,889 surviving participants in the meat, fish and egg intake groups, NIPPON DATA80, 1980–1999

	Meat		p	Fish		p	Egg		p
	<1/2 days	≥1/2 days		<1/day	≥1/day		<1/day	≥1/d	
Participants	775	1,114		1,073	816		1,221	668	
Cases with impaired ADL	41	34		39	36		51	24	
Odds ratio									
Age- and sex-adjusted	1	0.58 (0.36–0.93)	0.02	1	1.19 (0.75–1.89)	0.47	1	0.86 (0.52–1.42)	0.55
Model 1	1	0.61 (0.38–0.97)	0.04	1	1.25 (0.78–2.01)	0.35	1	0.89 (0.54–1.48)	0.66
Model 2	1	0.62 (0.38–0.99)	0.05	1	1.23 (0.77–1.97)	0.39	1	0.90 (0.54–1.49)	0.67
Model 3	1	0.61 (0.38–0.99)	0.04	1	1.25 (0.76–1.95)	0.42	1	0.90 (0.54–1.49)	0.68

During 19 years of follow-up, 75 participants became dependent due to impaired ADL. The numbers of participants at risk and cases with impaired ADL, age- and sex-adjusted as well as multivariate-adjusted (model 1–3) odds ratios (with 95% confidence intervals in parentheses) for impaired ADL are shown. Model 1 included age, sex, smoking (never and former smokers, current smokers <20, 20–40, ≥41 cigarettes/day), alcohol drinking (never, past, nondaily and daily), hypertension, diabetes and BMI. Model 2 included model 1 variables plus serum albumin and total cholesterol concentration. Model 3 included model 2 variables plus job type (professional or not) and urban residence. In the meat intake analysis, the covariates in model 3 that had significant contributions to the outcome were age (p = 0.0004), BMI (p = 0.009) and urban residence (p = 0.02).

During 19 years of follow-up, 75 participants became dependent due to impaired ADL. Associations of impaired ADL and food intake in the 1,889 surviving participants are shown in table 4. A higher intake of meat was associated with a statistically significant decrease in the occurrence of impaired ADL in all 4 models. The other covariates in model 3 that had significant contributions to the outcome were age (p = 0.0004), BMI (p = 0.009) and urban residence (p = 0.02). There were no interactions between sex and the effect of food intake on impaired ADL.

Discussion

We found that a higher intake of meat during middle age was associated with a statistically significant reduction in future occurrence of impaired ADL, although it was not associated with changes in composite outcome of either death or dependence due to impaired ADL. Intake of fish and eggs was not associated with the composite outcome or with impaired ADL outcome. These results were unexpected, since eggs and meat are believed to promote atherosclerosis, and fish is known to prevent atherosclerosis. Recently, it has been shown that low to normal serum albumin and total cholesterol concentrations were associated with impaired ADL using this cohort data as well as those of other studies [13, 16, 17]. However, in the present study, these concentrations were not different between the 2 groups in all 3 food intake categories.

Meat products are rich in saturated fatty acids that are thought to be atherogenic. In fact, a high intake of meat is classed as a component presumed to be detrimental to health in studies on dietary patterns, including in a Mediterranean diet [18, 19]. Surprisingly, however, there has been no prospective study to demonstrate the detrimental effects of meat intake on cardiovascular outcome. Actually, a higher meat intake had a neutral association with all-cause mortality, while a higher intake of fruits and nuts was inversely associated with all-cause mortality in a Mediterranean diet study [18]. There have been some cross-sectional studies related to associations between intake of meat and cardiovascular disease risk factors. Sadakane et al. [20] identified 3 dietary patterns from a food frequency questionnaire by factor analyses. In men, the meat pattern was associated with higher total as well as high- and low-density lipoprotein cholesterol; in women, it was associated with higher total and high-density lipoprotein cholesterol [20]. Two small studies found no effect of animal protein intake on blood pressure [21, 22]. The large-scaled INTERMAP study showed dietary animal protein intake was not associated with a higher blood pressure after adjustment for height and weight, while vegetable protein was inversely related to blood pressure [23]. To date, cross-sectional studies have failed to demonstrate any detrimental effect of meat intake or animal protein on cardiovascular disease risk factors. Interestingly, several longitudinal studies have suggested a beneficial effect of meat intake on cardiovascular outcomes. Using the Hiroshima/Nagasaki Life Span Study cohort data, Sauvaget et al. [24, 25] showed intake of animal

products had protective effects against intracerebral hemorrhage and cerebral infarction. Analyzing the Rotterdam Study data, Geleijnse et al. [26] showed CHD mortality was reduced in higher tertiles of dietary menaquinone compared to the lower tertile. Since major sources of menaquinone are meat, eggs and cheese, generally considered to be unhealthy diet, the authors thought it unlikely that the observed reduction in CHD risk was due to confounding factors. A cross-sectional study in the elderly showed protein intake, especially from animal sources, was associated with a better preservation of muscle mass [27], and a follow-up study in older, community-dwelling adults demonstrated dietary protein intake was inversely associated with a 3-year lean mass loss [28]. Recently, the intake of animal protein and fat in Japan has increased significantly; however, the current mean consumption of these nutrients in Japan is still low compared with Western countries [29–32]. It is possible that even if a very high meat intake is associated with negative outcomes, a higher intake in a lower range may have beneficial effects. Thus, there appears to be enough evidence to support our present finding that a higher intake of meat may prevent the occurrence of impaired ADL, although it was not associated with lower mortality.

Another factor that may relate to the association between meat intake and outcomes is the socioeconomic status (SES). Lower SES is associated with all-cause, as well as cardiovascular, morbidity and mortality [33–36]. In the present study, a higher intake of meat was associated with a higher prevalence of professional work and urban residence, both markers of a higher SES. Urban residence was a significant contributor to a lower risk for impaired ADL in the logistic analysis model. After adjustment for urban residence, however, a higher intake of meat remained statistically significant.

There are some limitations to this study. We did not assess the baseline ADL condition, therefore, we are not sure that all impaired ADL cases were new incidents during the follow-up period. However, because the participants came on foot to baseline examinations at local public health centers and we excluded participants who had a history of stroke, we considered the effect of any lack of information on our results to be negligible. Second, we do not have information on SES other than professional work and urban residence. Third, the time span between baseline data collection and ADL data collection is long; diets might have changed during this time in Japan. However, according to the National Health and Nutritional Survey in Japan, the average daily intakes of meat, fish and egg by Japanese aged 50–59 in 1986 were 58.7, 102.3 and 40.5 g, respectively; those by Japanese aged 60–69 in 1996 were 51.4, 106.7 and 36.4 g, respectively [37]. That is, there might not have been significant changes in diets in Japan during the study period.

In conclusion, a higher intake of meat may prevent impaired ADL occurrence, although it was not associated with a lower mortality.

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5年間の都老研式 IADL の推移と循環器疾患危険因子のリスク集積との関連 —NIPPON DATA90—

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Abstract

OBJECTIVES
日本人の代表集団において、65 歳以上の高齢者の循環器疾患危険因子の集積と5年間の手段的日常生活動作（IADL）の関連を明らかにする。
DESIGN
地域集団におけるコホート研究
METHODS
1990 年に全国から無作為抽出された 30 歳以上の住民を対象として循環器健診を実施した。この参加者のうち 1995 年の 65 歳以上の生存者を対象として都老研式 IADL 調査を行い、2000 年に再度同じ対象者に IADL の調査を行った。対象者数は 1995 年と 2000 年に調査ができ、調査項目をすべて回答した 1,222 名である。1990 年の循環器疾患危険因子の集積と 5 年間の IADL の変化との関連を分析した。
RESULTS
男女とも、5年間の IADL の変化量は高年齢群ほど有意に大きく低下していた。男女ともほぼすべての危険因子で、危険因子を有するほうが有さない場合に比して IADL 減少の絶対値が大きかった。ロジスティック回帰で性別、年齢、飲酒、過去の喫煙歴を調整すると、循環器疾患危険因子数と IADL の変化量は有意な負の関連を示した（p=0.029）。1995 年に身体的 ADL が自立していた者のみで解析しても、循環器疾患危険因子数と IADL 変化量の負の関連は有意であった（p=0.028）。
CONCLUSION
日本人の代表集団において、5年間の IADL 得点は循環器疾患危険因子数が増加するほど有意に低下していた。循環器疾患危険因子の集積は循環器疾患の発症や死亡に影響するだけでなく、IADL の低下にも影響していることが明らかになった。

Original Article

Relationship between 5-Year Decline in Instrumental Activity of Daily Living and Accumulation of Cardiovascular Risk Factors: NIPPON DATA90

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Aim: To clarify the relationship between the accumulation of cardiovascular risk factors and the 5-year decline in instrumental activity of daily living (IADL) among a cohort representative of the Japanese population aged 65 years and over.
Methods: An IADL survey was performed by public health centers throughout Japan. Study subjects were elderly men and women living in districts under the jurisdiction of collaborating health centers. Subjects were invited to participate in the IADL survey assessed by the Tokyo Metropolitan Institute of Gerontology (TMIG) Index of Competence twice in 1995 and in 2000; 1222 participants were eligible for the analysis. The relationship between the number of cardiovascular risk factors, such as hypertension, hypercholesterolemia, hypertriglycemia, low serum high-density lipoprotein cholesterol, diabetes, obesity and smoking, at baseline and the 5-year difference in IADL scores was examined by linear regression analysis and logistic regression analysis.
Results: Decrease in IADL scores was larger in those with cardiovascular risk factors than in those without. The multivariable odds ratio (OR) for decreased IADL after adding one CVD risk factor was 1.16 (95% confidence interval (CI), 1.04–1.29) after adjusting for age, sex, alcohol consumption and TMIG score at baseline. Among participants who were regarded as physically independent with respect to basic ADL in the baseline survey, the odds ratio was also similar and significant.
Conclusion: Preventive interventions directed against cardiovascular risk factors, especially against their accumulation, may contribute to maintaining IADL in the Japanese elderly.

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Key words; Accumulation of cardiovascular risk factors, Instrumental activity of daily living, Cohort study, General population

Objectives

It is very important to create a society in which the elderly can live a healthy and active life for as long as possible. To minimize disability in elderly people in Japan, where the numbers of those aged 65 and older are increasing each year, we need to clarify modifiable risk factors that predict the future decline in activity of daily living (ADL)[1, 2]. ADL is often used to evaluate the disabled elderly, for example, those requiring rehabilitation or nursing home admission; however, as ADL is not suitable for screening elderly residents who are not disabled but have a potential need for home health-care services[3], another indicator is needed to evaluate the ability to live independently in the community. Instrumental activity of daily living (IADL) has been used in this manner[4]; however, most previ-

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ous studies to clarify the determinants of IADL have been cross-sectional in design.

Cardiovascular risk factors, such as hypertension, dyslipidemia, and diabetes, are often clustered[5-7]. The presence of multiple risk factors, recently termed metabolic syndrome, has been reported to increase the risk of developing or dying from cardiovascular disease such as myocardial infarction and stroke[8, 9]. However, to our knowledge, few studies have examined the relationship between the accumulation of cardiovascular risk factors and a future decline in IADL in a community setting.

Accordingly, we attempted to followup a cohort thought to be representative of the Japanese population to evaluate the relationship between the 5-year decline in IADL and the accumulation of cardiovascular risk factors measured in the National Survey of Circulatory Disorders, 1990.

Methods

A cohort study of the participants in the 4th National Survey on Circulatory Disorders, Japan was performed in 1990, NIPPON DATA90 (National Integrated Project for Prospective Observation of Non-communicable Disease And its Trends in the Aged, 1990). The details of this cohort have been previously reported[1, 2, 5, 10-14]. A total of 8,384 community residents (3,504 men and 4,880 women, ≥30 years old) from 300 randomly selected districts participated in the survey and were followed until November 15, 2000. The overall population aged 30 years and older in all districts was 10,956, and the participation rate was 76.5%. Accordingly, these participants were thought to be representative of the Japanese population.

We performed a survey of basic ADL and IADL in 1995 (baseline) and 2000 of the elderly (≥65 years in 1995) members of this cohort. This survey was performed by the public health centers whose jurisdiction included cohort districts of NIPPON DATA90. Of 284 health centers, 245 collaborated with the present study; 1945 participants were living in districts under the jurisdiction of collaborating health centers in 1995, and 301 had died or moved to different districts by 2000. Accordingly, 1644 participants were included in the present study. Of these, 36 declined to participate, 89 could not be contacted, and 297 had missing information at 2000; therefore, 1222 subjects (492 men, 730 women) were eligible for analysis.

We used the Tokyo Metropolitan Institute of Gerontology (TMIG) Index of Competence, a widely used scale for measuring IADL with demonstrated reliability and validity[3, 15]. The first five questions (No. 1–5) inquire about instrumental independence, the subsequent four (No. 6–9) about intellectual activity, and the final four (No. 10–13) about social roles. The respondent selects either "yes" (one point) or "no" (zero points), for a maximum score of 13 points[3, 15]. Participants were also asked about five basic (physical) ADL items (Feeding, Dressing, Bathing, Toileting, and Transfer: walking indoors) and whether each of these could be accomplished without help, with partial help, or with full help. "Physical ADL decline" was defined as partial or full support needed to perform any of the five basic ADL items[1, 2].

We used home-visit interviews to assess subjects; if this was impractical, the questions were asked over the phone or the questionnaire was mailed.

Risk factors for cardiovascular disease were defined as the following seven items in 1990: hypertension (systolic blood pressure, SBP ≥140 mmHg and/or diastolic blood pressure, DBP ≥90 mmHg), diabetes (casual blood glucose ≥200 mg/dL and/or HbA1c ≥6.0), hypercholesterolemia (total cholesterol, TCH ≥240 mg/dL), low serum high-density lipoprotein (HDL) cholesterol (HDLC <40 mg/dL), high serum triglyceride (TG) (TG >150 mg/dL), obesity (BMI ≥25 kg/m^2), and current smoking.

We examined whether the difference in IADL scores differs depending on the presence or absence of each risk factor. A *t*-test or one-way analysis of variance was conducted for continuous variables and a chi-square test for proportions, and linear regression analysis to evaluate the relationship between the number of risk factors and the 5-year difference in IADL scores. The individual 5-year difference in IADL scores was calculated by subtracting the score in 1995 from that in 2000. We also performed logistic regression analysis to evaluate the relationship between the number of risk factors and IADL decline. In logistic regression analysis, we defined IADL decline as a 2-point decline in the TMIG score between 1995 and 2000, as a previous study reported that a difference of ±1 point in the TMIG score was within the error range[16]. In both regression analyses, we adjusted for age, sex and alcohol consumption as confounding factors (Model 1). Further adjustment of the TMIG score at baseline (in 1995) was also performed (Model 2). A p value of <0.05 was considered significant.

The Statistical Package for the Social Sciences (SPSS Japan Inc. version 14.0J, Tokyo, Japan) was used for analyses.

The present study was approved by the Institutional Review Board of Shiga University of Medical Science (No. 12–18, 2000).

Table 1. Mean scores of instrumental activities of daily living (IADL) assessed by the Tokyo Metropolitan Institute of Gerontology (TMIG) Index of Competence

	N	1995		2000		Mean IADL	*p* value*
		Mean	SD	Mean	SD		
Men							
65-69	204	12.0	1.9	11.4	2.9	−0.412	
70-74	164	11.9	1.8	10.7	3.3	−1.134	
75-79	81	11.8	2.0	9.4	3.9	−2.222	<0.001
80-84	37	10.7	3.3	7.9	3.8	−2.568	
85+	6	7.6	2.6	3.2	1.9	−3.167	
Women							
65-69	290	12.2	1.6	11.6	2.2	−0.476	
70-74	208	11.9	2.0	10.8	3.1	−1.154	
75-79	142	11.2	2.2	9.4	3.6	−1.634	<0.001
80-84	69	9.8	3.0	6.8	3.8	−2.855	
85+	21	7.4	3.9	4.4	3.6	−3.143	

Maximum score is 13.
Mean IADL was calculated by substracting the score in 1995 from than in 2000.
*Comparison between age groups by chi-square test.

Results

The mean age of subjects in 1995 was 71.9 (standard deviation, SD=5.0) years for men and 72.8 (SD=5.7) years for women. The difference in IADL scores rated by the TMIG Index of Competence is shown by sex and age group in **Table 1**. Between the two surveys, mean IADL scores decreased significantly in the older age groups in both men and women. The absolute value of decrease in the IADL scores was also large in the older age groups in both men and women. In men aged 65 to 69, the decrease in the IADL score was 0.412 points, while in those aged 85 years and older, it was 3.167. In women aged 65 to 69, the decrease in IADL score was 0.476 points, while in those aged 85 and older it was 3.143.

Participants were classified into "risk status categories" according to the number of cardiovascular risk factors (obesity, hypertension, hypercholesterolemia, diabetes, low serum HDLC, high serum TG, and current smoking). **Table 2** shows the means and prevalence of each risk factor. There was no difference in mean age between the risk status categories. Hypertension was the most prevalent risk factor in all categories except for the 4+ risk factor category in women. In the 4+ risk factor category, obesity was observed in 63.4% of men and 80.0% of women. In this category, diabetes was also detected in 66.2% of men and 79.5% of women. The mean decreases in IADL scores according to the number of CVD risk factors (0, 1, 2, 3, 4) were -0.90, -1.03, -1.05, -1.67 and -1.25, respectively.

Table 3 shows the difference in IADL scores between 1995 and 2000, focusing on the presence/absence of cardiovascular risk factors. The decrease in IADL scores was larger in both men and women with any cardiovascular risk factors (with the exception of hypercholesterolemia and high serum TG) than in those without. In this comparison, however, no significant difference was observed other than for low serum HDLC in women.

Table 4 shows the relationship between the 5-year difference in IADL scores and the number of cardiovascular risk factors at the baseline survey. As the number of cardiovascular risk factors increased, IADL scores decreased significantly. Among subjects who were regarded as independent with respect to basic (physical) ADL in the first IADL survey in 1995, IADL scores also decreased significantly as the number of cardiovascular risk factors increased.

The multivariable odds ratio (OR) for decreased IADL after adding one CVD risk factors in model 1 was 1.15 (95% confidence interval (CI), 1.04–1.28). When we performed further adjustment for the TMIG score at baseline (Model 2), the odds ratio was almost the same (OR, 1.16; 95%CI, 1.04–1.29). Among participants who were regarded as physically independent with respect to basic ADL in the baseline survey, the odds ratio was also similar and significant.

Although the TMIG score indicated a broader

Table 2. Means and prevalences of baseline characteristics stratified by the number of risk factors at the baseline survey, NIPPON DATA90

	Number of risk factors					*p* value
	None	One	Two	Three	Four or more	
Men						
Number of participants (%)	48 (10.1)	134 (28.1)	144 (30.2)	86 (18.0)	65 (13.6)	
Age (years)	72.6±6.0	72.9±5.4	71.5±4.7	71.5±4.4	71.3±4.7	0.093
Body mass index >25 (%)	0.0	4.2	12.8	27.5	63.4	<0.001
Smoking habit						
Ex-smoker (%)	60.4	53.7	20.8	25.6	26.2	<0.001
Current smoker (%)	0.0	23.1	66.0	58.1	64.6	
Drinking habit						
Ex-drinker (%)	10.4	7.5	8.3	10.5	16.9	0.285
Daily drinker (%)	45.8	56.7	56.9	44.2	46.2	
Hypertension (%)	0.0	56.0	75.7	72.1	89.2	<0.001
Hypercholesterolemia (%)	0.0	2.2	6.3	17.4	43.1	<0.001
Low HDL (%)	0.0	6.0	18.1	47.7	75.4	<0.001
High TG (%)	0.0	7.5	16.0	69.8	83.1	<0.001
Diabetes (%)	0.0	4.5	13.2	27.9	66.2	<0.001
Women						
Number of participants (%)	80 (11.9)	207 (30.7)	193 (28.6)	121 (18.0)	73 (10.8)	
Age (yr)	72.0±5.7	72.3±5.6	72.7±5.6	73.2±5.8	73.2±5.1	0.465
Body mass index >25 (%)	0.0	10.7	31.1	49.2	80.0	<0.001
Smoking habit						
Ex-smoker (%)	2.5	1.4	1.6	4.1	2.7	<0.001
Current smoker (%)	0.0	3.4	4.7	8.3	21.9	
Drinking habit						
Ex-drinker (%)	0.0	0.0	0.0	0.8	4.1	0.008
Daily drinker (%)	5.0	1.9	4.1	3.3	4.1	
Hypertension (%)	0.0	59.9	76.7	83.5	91.8	<0.001
Hypercholesterolemia (%)	0.0	10.6	32.1	44.6	49.3	<0.001
Low HDL (%)	0.0	5.8	12.4	38.0	60.3	<0.001
High TG (%)	0.0	8.2	38.3	66.9	94.5	<0.001
Diabetes (%)	0.0	11.1	31.6	47.9	79.5	<0.001

HDL, high density lipoprotein. TG, triglyceride.
The number of risk factors was the sum of the following seven items: hypertension, diabetes, hypercholesterolemia, low serum HDL cholestrol, high serum TG, obesity, and current smoking.

range of activity in daily life for the elderly than the narrowly defined IADL, the above results were substantially similar when we only used the subscale of IADL in the TMIG score.

Discussion

The present study found a significant inverse relationship between the number of cardiovascular risk factors and the decrease in IADL scores during a 5-year period in this representative sample of elderly Japanese people. Even though the effect of each individual risk factor did not reach statistical significance, the accumulation of cardiovascular risks resulted in a significant decrease in IADL scores. These results suggest that appropriate management of the cardiovascular risk factors might prevent a decline in IADL in elderly residents.

Okamura *et al.* reported that elderly residents with systolic hypertension (≥160 mmHg) in two communities located in Akita and Kochi Prefectures showed a 3.41 times higher odds ratio for having low IADL scores than those with normal blood pressure[17]; however, they surveyed the TMIG Index of Compe-

Table 3. Decrease in IADL scores from 1995 to 2000 by the presence/absence of risk factors, NIPPON DATA90

Age (years)	Men 71.9 (±5.0)			Women 72.8 (±5.7)		
	N	mean ΔIADL	*p* value	N	mean ΔIADL	*p* value
BMI						
BMI <25	400	−1.11	0.545	513	−1.11	0.211
BMI ≥25	92	−1.32		217	−1.40	
Smoking						
Non-smoker	92	−0.87		664	−1.16	
Ex-smoker	173	−1.43	0.268	19	−2.47	0.142
Current smoker	227	−1.04		47	−1.26	
Hypertension						
SBP <140 and DBP <90	180	−1.09	0.768	258	−1.11	0.544
SBP ≥140 or DBP ≥90	312	−1.18		472	−1.24	
Hypercholesterolemia						
TCH <240	422	−1.17	0.890	500	−1.14	0.804
TCH ≥240	55	−1.11		174	−1.21	
HDL						
HDL ≥40	353	−1.10	0.483	548	−1.03	0.016
HDL <40	124	−1.32		126	−1.71	
TG						
TG <150	330	−1.24	0.410	433	−1.09	0.396
TG ≥150	147	−0.99		241	−1.29	
Diabetes						
Glucose <200 and HbA1c <6.0	443	−1.11	0.178	633	−1.12	0.209
Glucose ≧200 or HbA1c ≧6.0	34	−1.82		41	−1.71	

IADL, instrumental activities of daily living.
HDL, high density lipoprotein. TG, triglyceride.

tence only at the end of follow-up. In the Framingham Disability Study, Pinsky *et al.* reported that hypertension, obesity, and diabetes adversely affected ADL in women after 27 years, while only hypertension adversely affected ADL in men[18]; however, IADL was not evaluated in that study. We reported the impact of serum albumin and total cholesterol (TC) on ADL in NIPPON DATA80[19]. Serum albumin was inversely associated with a composite outcome of death or impaired ADL in the group below the median of TC in both sexes; however, in that study, IADL was not evaluated and ADL was assessed only at the end of follow-up.

The above-mentioned previous studies focused only on the relationship between the respective risk factors and ADL or IADL. As previously reported, individual risk factors, such as hypertension, dyslipidemia, and diabetes, are associated with the development of cardiovascular disease; however, even though each of these cardiovascular risk factors may elevate the risk only slightly, the risk becomes more powerful when they are combined[20, 21]. Metabolic syndrome is a cluster of risk factors comprising insulin resistance, increased abdominal fat, dyslipidemia, and hypertension[22]. To our knowledge, the present study is the first to show the relationship between the accumulation of cardiovascular risk factors and IADL in community-dwelling elderly using a cohort design.

The present study suggests that the presence of multiple risk factors might contribute to the decline in IADL in the future. Cerebral infarction associated with impaired cognition without a clinical symptom is common, even in older men and women[23]. Bokura *et al.* suggested that the clustering of metabolic risk factors tended to increase the prevalence of silent cerebral ischemic lesions in 1,151 healthy Japanese subjects[24]. Furthermore, Elias *et al.* indicated that the risk factor profile for stroke was associated with low cognitive performance in a cross-sectional analysis of the Framingham Offspring Study[25]. These findings were consistent with those of the present study.

There are several limitations to our study. First,

Table 4. Relationship between the 5-year decline in scores of instrumental activity of daily living (IADL) and the number of cardiovascular risk factors

Five- year decrease in IADL scores assessed by the TMIG Index of Competence			
Baseline risk factors	Regression coefficient (β)	95%CI	p
Total participants (n=1,222)			
Model 1	−0.149	(−0.278, −0.020)	0.029
Model 2	−0.161	(−0.285, −0.036)	0.011
Participants without physical ADL decline at baseline (n=1,155)			
Model 1	−0.146	(−0.277, −0.015)	0.028
Model 2	−0.171	(−0.297, −0.046)	0.008
Odds ratio for IADL decline* during 5-year period			
	Odds Ratio	95%CI	p
Total participants (n=1,222)			
Model 1	1.15	(1.04, 1.28)	<0.001
Model 2	1.16	(1.04, 1.29)	0.008
Participants without physical ADL decline at baseline (n=1,155)			
Model 1	1.15	(1.03, 1.28)	0.015
Model 2	1.15	(1.03, 1.29)	0.013

*The number of risk factors was the sum of the following seven items: hypertension, diabetes, hypercholesterolemia, low serum HDL cholestrol, high serum TG, obesity, and current smoking.
Model 1, include age, sex, number of risk factors, daily alcohol consumption, ex-drinker and ex-smoker;
Model 2, model 1 + TMIG at baseline (1995).
Sex was defined as Male=0 and Female=1.
Daily drinking means drinking at least 1 drink per day.
Ex-drinker means having discontinued alcohol consumption.
Ex-smoker means having discontinued smoking.

the risk factors selected were examined not in the initial IADL survey but in the survey conducted 5 years earlier. However, the accuracy of cardiovascular risk factor definition was assured because risk factors were based on medical examinations rather than on respondents' self-reports. Moreover, participants with severe disease at the time of the risk factor survey might have found it difficult to attend the first IADL survey, which was held 5 years later. This might have allowed us to avoid "reverse-causality"; in other words, participants with subclinical severe disease that was not detected by the risk factor survey were less likely to be included in the first IADL survey.

As previously reported, NIPPON DATA90 was a cohort study of a representative sample of Japanese, as participants of this cohort were randomly selected from the Japanese population; however, in the present study, as subgroup analysis of elderly participants of NIPPON DATA90, participants were limited to those living in districts under the jurisdiction of collaborating health centers, although we believe that there was no systematic bias in the regions whese public health centers did not collaborated with the present study. Non-surveyed districts were distributed uniforml throughout Japan. Furthermore, there was no difference in substantial health status between surveyed and non-surveyed districts due to the incorporation of health centers. For example, there was not significant difference in all-cause mortality between two districts during follow-up periods. Second, because the IADL survey was conducted only every 5 years, we could not pinpoint exactly when and why IADL declined during the 5-year period.

In conclusion, we found a significant relationship between the number of cardiovascular risk factors and the decrease in IADL scores among this cohort, which is thought to be representative of the Japanese population. Interventions aimed at preventing cardiovascular risk factors, especially the accumulation of such risk factors, may therefore be effective to prevent a future decline in IADL for the Japanese elderly, allowing them to live a healthy and active life.

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Appendix 1. NIPPON DATA90 Research groups

NIPPON DATA90	"National Integrated Project for Prospective Observation of Non-communicable Disease And its Trends in the Aged"
Chairman	Hirotsugu Ueshima (Department of Health Science, Shiga University of Medical Science, Otsu, Shiga)
Consultant	Osamu Iimura (Hokkaido JR Sapporo Hospital, Sapporo, Hokkaido), Teruo Omae (Health C&C Center, Hisayama, Kasuya, Fukuoka), Kazuo Ueda (Murakami Memorial Hospital, Nakatsu, Oita), Hiroshi Yanagawa (Saitama Prefectural University, Koshigaya, Saitama), Hiroshi Horibe (Aichi Medical University, Nagakute, Aichi)
Research Members	Akira Okayama (The First Institute for Health Promotion and Health Care, Japan Anti-Tuberculosis Association, Chiyoda-ku, Tokyo), Kazunori Kodama, Fumiyoshi Kasagi (Department of Epidemiology, Radiation Effects Research Foundation, Hiroshima, Hiroshima), Tomonori Okamura (Department of Preventive Cardiology, National Cardiovascular Center, Suita, Osaka), Yoshikuni Kita (Department of Heath Science, Shiga University of Medical Science, Otsu, Shiga), Takehito Hayakawa (Department of Hygiene and Preventive Medicine, Fukushima Medical University, Fukushima, Fukushima), Shinichi Tanihara (Department of Hygiene and Preventive, Fukuoka university, Fukuoka, Fukuoka), Shigeyuki Saito (Second Department of Internal Medicine School of Medicine, Sapporo Medical University, Sapporo, Hokkaido), Kiyomi Sakata (Department of Hygiene and Preventive Medicine, Iwate Medical University School of Medicine, Morioka, Iwate), Yoshikazu Nakamura (Department of Health Science Division of Epidemiology and Community Health, Jichi Medical School, Minami Kawachi, Tochigi), Fumihiko Kakuno (Higashi-Oumi Public Health Center, Higashi-Oumi, Shiga),
Research Associate Members	Toshihiro Takeuchi, Mitsuru Hasebe, Fumitsugu Kusano, Takahisa Kawamoto and members of 300 Public Health Centers in Japan, Masumi Minowa (Faculty of Humanities, Seitoku University, Matsudo, Chiba), Minoru Iida (Kansai University of Welfare Sciences, Kashiwara, Osaka), Tsutomu Hashimoto (Kinugasa General Hospital, Yokosuka, Kanagawa), Shigemichi Tanaka (Department of Cardiology, Cardiovascular Center, Teine Keijinkai, Sapporo, Hokkaido), Atsushi Terao (Health Promotion Division, Department of Public Health and Welfare, Shiga Prefecture, Otsu, Shiga), Katsuhiko Kawaminami (Department of Public Health Policy, National Institute of Public Health, Wako, Saitama), Koryo Sawai (The Japanese Association for Cerebro-cardiovascular Disease Control, Tokyo), Shigeo Shibata (Clinical Nutrition, Kagawa Nutrition University, Sakado, Saitama)

Appendix 2. Questions on the multidimensional 13-item index of competence

(1) Can you use public transportation (bus or train) by yourself?	Yes / No
(2) Are you able to shop for daily necessities?	Yes / No
(3) Are you able to prepare meals by yourself?	Yes / No
(4) Are you able to pay bills?	Yes / No
(5) Can you handle your own banking?	Yes / No
(6) Are you able to fill out forms for your pension?	Yes / No
(7) Do you read newspapers?	Yes / No
(8) Do you read books or magazines?	Yes / No
(9) Are you interested in news stories or programs dealing with health?	Yes / No
(10) Do you visit the homes of friends?	Yes / No
(11) Are you sometimes called on for advice?	Yes / No
(12) Are you able to visit sick friends?	Yes / No
(13) Do you sometimes initiate conversations with young people?	Yes / No

日本食と寿命

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目的

男女ともわが国は世界最長寿国であるが、元気な高齢者が多いことも事実で、健康で自立して生活できる年齢＝健康寿命もわが国が世界 1 位である。長寿の一因と期待される日本食であるが、飽和脂肪酸摂取が少なく、不飽和脂肪酸摂取が比較的多く、また全摂取熱量に対する脂肪由来の熱量が西洋食に比べて少ないことが心筋梗塞や乳癌が少ない一因で得あると指摘されているが、食塩摂取量が多いのがわずかある欠点である。日本食パターンに関する疫学研究は少ないため、今回検討を行った。

方法

減塩に注意した日本食が寿命に及ぼす影響を 19 年間追跡した NIPPON DATA80 を用いて検討した。追跡開始時にすでに脳梗塞、心筋梗塞の既往のある対象は除外した計 9,086 例（男 4,018、女 5,068）について解析した。健康日本食スコアのもとになる構成要因を以下のように設定した：卵摂取≦2 個/週、魚摂取≧1 回/2 日、肉摂取≦2 回/週、漬物摂取≧1 回/日、麺類の汁を残す、減塩醤油の使用、機会飲酒の 7 項目。スコアにより各群の対象人数がほぼ等しいように 3 群に分けた：スコア 0-2 群、スコア 3 群、スコア 4-7 群。各群の総死亡率、死因別死亡率について Cox 比例ハザードモデルを用いて多変量解析した。

結果

追跡期間中に総死亡が 1,823、心血管死が 654、脳卒中死が 299、心筋梗塞が死 131、癌死が 511 あった。スコアが高い群ほど総死亡、心血管死、脳卒中死が有意に約 20% 減少し、癌死と心筋梗塞死も低下する傾向にあった(表)。

結論

塩分摂取が過多にならないよう注意した健康日本食は総死亡、心血管死、脳卒中死を有意に 20%以上低下させることが判明した。われわれは単に食品を無関連に食べるのでは無く、例えば日本食とか地中海食といった様にパターンとして食べる。本研究は食品パターンについての重要性を提起したと考える。