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Factors associated with activity limitation used to calculate healthy life expectancy according to Health Japan 21 (the second term): analysis of national health statistics data

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Abstract

Objectives: We examined whether selected factors were associated with activity limitation used to calculate the healthy life expectancy in accordance with the target of Health Japan 21 (the second term).

Methods: Data for 6251 subjects were obtained from the Comprehensive Survey of Living Conditions and the National Health and Nutrition Survey, both of which were conducted by the Ministry of Health, Labour and Welfare of Japan in 2010. The age-adjusted odds ratios (AOR) of limitation of activity for the assessed factors were estimated using a logistic model.

Results: The percentage of persons with activity limitation was 12.1% of men and 15.6% of women. For men, low body mass index (BMI) (AOR: 2.02, p=0.008), high blood pressure (AOR: 1.53, p=0.021), high hemoglobin A1c (HbA1c) (AOR: 1.99, p=0.000), a small number of steps (AOR: 1.68, p=0.002), and high intake of salt (AOR: 0.69, p=0.010) were significantly associated with limitation of activity. For women, high BMI (AOR: 1.49, p=0.003), a small number of steps (AOR: 1.48, p=0.009), and high intake of salt (AOR: 0.77, p=0.017) were significantly associated with activity limitation.

Conclusion: We identified several factors that were associated with activity limitation. Our results from cross-sectional data require careful interpretation before concluding whether these relationships are causal.

Keywords: healthy life expectancy, National Health and Nutrition Survey, health promotion, health statistics, epidemiology

Introduction

Healthy life expectancy has been used for evaluating population health and planning health countermeasures in many countries.[1-4] In Japan, the extension of healthy life expectancy is a main target of "The second term of the National Health Promotion Movement in the twenty first century (Health Japan 21, the second term)," a nationwide project for health promotion from the 2013 to the 2022 fiscal year established by the Ministry of Health, Labour and Welfare.[5] The healthy life expectancy in 2010 in Japan was calculated using data on mortality from vital statistics and on proportions of persons with activity limitation from the Comprehensive Survey of Living Conditions (CSLC).[5-7]

Many factors are associated with mortality and activity status. Correspondingly, many factors likely influence the extension of healthy life expectancy.[6] The targets of Health Japan 21 (the second term) include maintaining ideal body weight; decreasing blood pressure, total cholesterol, low density lipoprotein (LDL) cholesterol, hemoglobin A1c (HbA1c) and the intake of salt; and increasing the number of steps taken and intake of vegetables and fruits.[5] Indicators of those factors are evaluated annually using data from the National Health and Nutrition Survey (NHNS).[8] However, associations between those factors and activity limitation have not yet been reported.

We aimed to examine whether selected factors are associated with activity limitation used for calculating healthy life expectancy in the target of Health Japan 21 (the second term) by analyzing 2010 data from the CSLC and NHNS.

Methods

Data

Data from the CSLC and NHNS in 2010, which were conducted by the Ministry of Health, Labour and Welfare of Japan, were used in this study. The CSLC, a self-administered questionnaire, was distributed to about 760,000 persons in randomly selected households nationwide.[7] The NHNS includes physical examinations (anthropometry measurements, blood pressure, blood test, and number of steps measured by a pedometer) and dietary surveys (weighing the amount of food consumed over 1 day) of about 10,000 persons in randomly selected households nationwide.[8]

Because the CSLC and NHNS shared sampling units, it was possible to link the survey datasets by using the survey year, prefecture, area, household number, number of household members, sex, and age.[9,10] Of the 9636 participants in 2010 NHNS, 9061 (94.0%) were linked with CSLC. Participants who

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were younger than 20 years and those with missing data regarding activity limitation were then excluded. Ultimately, data of 6251 participants (2967 men and 3284 women) were analyzed. The data from both surveys were used with the permission of the Ministry of Health, Labour and Welfare of Japan.

Activity limitation and assessed factors

Data regarding activity limitation of CSLC participants were collected by asking the question: "Is your daily life now affected by health problems?".[7] The answers were used to calculate the healthy life expectancy according to the target of Health Japan 21 (the second term).[5,6] Data concerning body mass index (BMI), blood pressure, total cholesterol, LDL cholesterol, HbA1c, number of steps taken, and intake of salt, vegetables and fruits were also used. Each of these factors were classified into two or three categories, as shown in Table 2, the factors and categories having been chosen to match those used in the target of Health Japan 21 (the second term).[5]

Statistical analysis

The proportions of people with activity limitation for each 5-year age group (20-24, 25-29, and so on up to 85 years and over) were calculated. The age-adjusted odds ratios (AOR) and 95% confidence intervals (CI) were estimated using logistic models with activity limitation as a dependent variable, and age groups (dummy variables) and each of the assessed factors as independent variables. Because some data were missing for each factor, the number of subjects available for analysis of a factor varied from 3054 to 5687. All analyses were performed using the SAS statistical package, version 9.3 (SAS Institute, Cary, North Carolina, USA), with the significance level set at $P<0.05$ for a two-sided test.

Results

Table 1 shows the number of subjects and persons with activity limitation by age group: overall, they comprised 12.1% of men and 15.6% of women, comprising less than 10% in age groups younger than 50 years and gradually increasing, reaching more than 50% in the age group of 85 years or older.

Table 2 shows AORs of activity limitation for the assessed factors. In men, low BMI (AOR: 2.02), high blood pressure (AOR: 1.53), high HbA1c (AOR: 1.99), a small number of steps (AOR: 1.68), and high intake of salt (AOR: 0.69) were significantly associated with activity limitation. In women, high BMI (AOR: 1.49), a small number of steps (AOR: 1.48), and high intake of salt (AOR: 0.77) were significantly associated with activity limitation.

Table 1. Number of subjects and of persons with activity limitation by age group

Age (years)	Men			Women		
	No. of subjects	No. of persons with activity limitation	(%)	No. of subjects	No. of persons with activity limitation	(%)
20–24	138	6	(4.3)	139	7	(5.0)
25–29	163	10	(6.1)	167	16	(9.6)
30–34	218	8	(3.7)	232	16	(6.9)
35–39	281	12	(4.3)	314	26	(8.3)
40–44	286	23	(8.0)	269	12	(4.5)
45–49	229	14	(6.1)	278	27	(9.7)
50–54	254	22	(8.7)	250	30	(12.0)
55–59	254	28	(11.0)	298	30	(10.1)
60–64	335	40	(11.9)	359	72	(20.1)
65–69	292	56	(19.2)	303	36	(11.9)
70–74	212	43	(20.3)	237	53	(22.4)
75–79	150	44	(29.3)	210	78	(37.1)
80–84	97	24	(24.7)	137	54	(39.4)
≥ 85	58	30	(51.7)	91	56	(61.5)
Total	2,967	360	(12.1)	3,284	513	(15.6)

Table 2. Age-adjusted odds ratios of limitation of activity for assessed factors

Factor	Category	Men				Women			
		No. of persons with limitation of activity (%)		Age-adjusted odds ratio of limitation of activity (95% confidence interval)	P value	No. of persons with limitation of activity (%)		Age-adjusted odds ratio of limitation of activity (95% confidence interval)	P value
Body mass index	High (≥ 25 kg/m^2)	93	(13.8)	1.31 (0.99 – 1.74)	0.061	110	(21.0)	1.49 (1.14 – 1.95)	0.003
	Normal (18.5–24.9)	159	(11.2)	1.00		236	(13.1)	1.00	
	Low (<18.5)	24	(23.3)	2.02 (1.20 – 3.41)	0.008	42	(14.0)	1.11 (0.76 – 1.62)	0.604
Blood pressure	High (≥ 140/90 mmHg and/or treated for hypertension)	147	(18.5)	1.53 (1.07 – 2.21)	0.021	165	(21.5)	1.06 (0.77 – 1.45)	0.724
	Normal	55	(9.2)	1.00		129	(11.3)	1.00	
Total cholesterol	High (≥ 240 mg/dL and/or treated for hyperlipidemia)	61	(17.7)	1.33 (0.95 – 1.88)	0.102	104	(18.2)	1.13 (0.84 – 1.53)	0.420
	Normal	123	(12.9)	1.00		156	(12.8)	1.00	
LDL cholesterol	High (≥ 160 mg/dL and/or treated for hyperlipidemia)	55	(18.5)	1.39 (0.97 – 1.98)	0.071	94	(20.8)	1.34 (0.98 – 1.82)	0.063
	Normal	129	(12.9)	1.00		166	(12.4)	1.00	
Hemoglobin A1c	High (≥ 6.0% (NGSP) and/or treated for diabetes)	88	(23.0)	1.99 (1.42 – 2.78)	0.000	80	(18.6)	1.01 (0.74 – 1.39)	0.942
	Normal	96	(10.6)	1.00		175	(13.1)	1.00	
Number of steps	Low (<9,000/day for males, <8,500/day for females)	246	(13.8)	1.68 (1.22 – 2.32)	0.002	356	(16.8)	1.48 (1.10 – 1.98)	0.009
	High	52	(7.1)	1.00		65	(8.9)	1.00	
Intake of salt	High (≥ 8.0 g/day)	250	(11.8)	0.69 (0.53 – 0.92)	0.010	282	(14.5)	0.77 (0.62 – 0.95)	0.017
	Low (<8.0)	88	(15.9)	1.00		197	(18.4)	1.00	
Intake of vegetables	Low (<350 g/day)	232	(12.6)	1.16 (0.90 – 1.50)	0.262	347	(15.8)	1.12 (0.89 – 1.42)	0.330
	High (≥ 350)	106	(12.8)	1.00		132	(16.1)	1.00	
Intake of fruits	Low (<100 g/day)	193	(11.3)	1.11 (0.86 – 1.43)	0.410	239	(14.3)	1.06 (0.86 – 1.32)	0.573
	High (≥ 100)	145	(15.1)	1.00		240	(17.8)	1.00	

Discussion

Activity status was queried with CSLC using the questions: "Is your daily life now affected by health problems?" and "How is it affected?",[7] the second of these questions intended only for persons replying "Yes" to the first question. The possible responses to the second question were "activities of daily living (including rising, dressing/undressing, eating, and bathing)," "going out," "work, housework, or schoolwork," "physical exercise (including sports)," and "other." We expected that the daily life referred to in the first question would include the activities listed in the second question, and those who responded "Yes" to the first question likely had mild or moderate rather than severe limitations in daily life, as mentioned in a previous report.[11] Therefore, the factors associated with such an activity limitation would be important for a healthy and active life.

In previous studies, associations between outpatient visits for some diseases (e.g., cancer, ischemic heart disease, cerebrovascular disease) or smoking and activity limitation were analyzed using CSLC data.[11,12] However, an analysis of factors associated with activity limitation using NHNS data has not previously been reported. We used the data of both the CSLC and NHNS, thus maximizing representation of the overall Japanese population.[9,10] The number of subjects for analysis of each of the factors varied widely because of varying amounts of missing data. Because the data used were cross-sectional, their analysis shows cross-sectional associations. Thus, careful interpretation is required before concluding whether these relationships are causal.

We found that a high BMI and a small number of steps were associated with activity limitation. It is well-known that BMI and walking strongly promote a healthy and active life.[13-16] Our results support those previous findings and suggest that lowering BMI and increasing walking may extend healthy life expectancy. Although we expected low BMI to be associated with activity limitation, we observed this association only in men, not in women; the reason for this discrepancy is unknown. We also found an association between high blood pressure, high HbA1c and activity limitation. Those factors are known to be related to unhealthy lifestyles and are important predictors of cardiovascular disease.[17,18] Our results concur with previous findings. However, high intake of salt, which is considered an unhealthy lifestyle factor,[19] was inversely associated with activity limitation, indicating that intake of salt was lower in persons with activity limitation than in more active subjects. Because this is a cross-sectional observation, it does not establish a causal relationship between high salt intake and activity limitation. Further studies of this lifestyle factor are therefore warranted.

In conclusion, we found several factors associated with activity limitation. Because our results are from cross-sectional data, careful interpretation would be required before concluding whether these relationships are causal.

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Conflict of Interest

The authors report no conflicts of interest in this work.

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