Relationship Between Health Practices and Education Level in the Rural Japanese Population

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Past studies in Europe and the USA have found that people with higher education levels have better health practices. The aim of this study was to examine the association between health practices and education level among people in a rural Japanese community. Data were derived from the Ohsaki National Health Insurance Cohort Study, which has been following 52,029 NHI beneficiaries, aged 40 to 79 years, in Miyagi Prefecture, Japan. The relationship between education level and seven health indices (smoking, drinking, body mass index, sleeping, exercise, breakfast, and snacks) was analyzed. Higher education was associated with shorter sleeping hours for both men and women, and lower BMI for women. In age groups younger than 70 years, people with higher education tended to exercise more. Smoking for women, alcohol consumption, and a Health Practices Index were not related to education levels. These results are different from those from Europe and the USA. This study suggests that the relationship between health practices and education level is weaker in Japan than in Europe and the USA.

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Socioeconomic status (SES) is a major determinant of health status and subsequent mortality ¹⁻⁵. In addition to different levels of access to health care by SES, one explanation for this association is that people's health-related lifestyles are dictated by SES. Studies in Europe and the USA have found that people with a higher education level, a typical proxy variable for SES, have lower rates of smoking, excessive alcohol consumption, obesity and moderate physical activity ⁶⁻¹⁴.

However, no study has yet examined the relationship between health-related lifestyle and education level in the Japanese population. The basic education level in Japan is higher than in Europe and the USA, but income is less strongly associated with education level ¹⁵⁻¹⁷. It is not clear whether the relationship between health practices and education level identified in Europe and the USA exists in Japan. Knowledge of the relationship would lead to better health education and services for the community.

The purpose of this study was to examine the relationship

between health practices and education level among the people living in a rural Japanese community.

MATERIALS AND METHODS

Study design and subjects

Data were derived from a baseline survey from the Ohsaki National Health Insurance (NHI) Cohort Study, which has been following 52,029 NHI beneficiaries aged 40 to 79 years in 14 municipalities in Miyagi Prefecture, Japan, since 1994. The study design and baseline characteristics of the subjects have been described in detail ^{18,19}. The study used a questionnaire consisting of 93 items such as: smoking history, alcohol history, alcohol volume, weight, height, sleeping hours, physical exercise, eating breakfast, eating snacks, and education.

The baseline survey was conducted from September to December 1994. Public health officials in each municipality visited each study subject at home with a questionnaire. The

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subjects were informed of the study objectives and their right to decline. If they consented, they were asked to complete the questionnaire by themselves. The same public health officials visited them again about a week later to collect the questionnaire. The response rate was 94.6% (52,029/54,996).

Study variables

We examined the relationship between education level and seven health practices defined by Belloc and Breslow²⁰ smoking history, alcohol consumption, body mass index (BMI, kg/m²), sleeping, exercise, breakfast, and snacks.

Smoking history was recorded as non-smoker, ex-smoker, or current smoker. Drinking history was recorded as non-drinker, ex-drinker, or current drinker. Current drinkers were asked about the name of alcohol beverages and its quantity consumed at one time; this was recorded as "4 go or less at one time" or "5 go or more at one time" (a go is a traditional unit in Japan, approximately 180 ml of sake, containing 30 g of ethanol). BMI was calculated from self-reported weight and height. It was recorded as underweight (< 19.8), normal (19.8-24.2), or overweight (> 24.2), based on the criteria of the Japan Obesity Society²⁰. Of 52,029 subjects, 16,346 men or women participated in health examination in 1995 and had their weight and height measured. These values were strongly correlated with self-reported weight and height of baseline survey (weight ; $r=0.933$, height ; $r=0.929$). Sleeping hours in an ordinary day were recorded as < 7 hours per night, 7-8 hours per night, or > 8 hours per night. The total number of hours the subjects spent on physical exercise per week was recorded as ≥ 3 hours or < 3 hours. Breakfast was recorded as "eating almost every day," or "not eating almost every day." The number of snacks per week was recorded as 0-2 times per week or ≥ 3 times per week.

Using Belloc and Breslow's scoring system²⁰, a Health Practices Index (HPI) was calculated (Table 1). The HPI ranges from 0 to 7, where 7 indicates best health practice.

For education level, we asked the subjects to report their highest academic degree attained. We categorized them as junior high school (9-year education); high school (12-year education); or junior college, college, and beyond (14-year

education or more).

Statistical analysis

The relationship between each health practice and education level was analyzed by using the χ^2 -test and ANOVA in SAS²². We considered $p < 0.05$ to be statistically significant. We examined each of four age groups (40-49, 50-59, 60-69, and 70-79 at baseline) separately. This allowed us to exclude the effect of association between age and education level that exists in Japan. The proportion of people who entered high school increased from 58% in 1960 to > 90% in 1980. The proportion of those who then entered college increased from 10% in 1960 to > 30% in 1980²³.

RESULTS

Of 52,029 subjects, 34,475 (18,568 men and 15,907 women) responded to all ten questions (Table 2). Those who responded to all questions had a higher education level ($p < 0.001$) and were younger ($p < 0.001$) than those who missed one or more questions (6326 men and 11,228 women). The following findings are derived from those who responded to all questions.

Smoking (Table 3)

There tended to be fewer current smokers and more ex-smokers among men with a higher education than among men with a lower education. Significant differences were found in the 40-49 age group ($p < 0.01$) and the 60-69 age group ($p < 0.0001$).

More women who had completed only junior high school (except those in the 50-59 age group) were current smokers than women in the other education groups, although current smokers were only 5%-20% of the subjects. A significant difference between education level of current smokers was found in the 40-49 age group ($p < 0.0001$): there were fewer current smokers among women with a higher education. However, in the 50-59 age group, more college graduates were current smokers than in the other education groups ($p < 0.05$). In the 60-69 age group, more college graduates were current smokers than high school graduates. Thus, a consistent relationship was not found between education level and smoking.

Table 1. Health Practice Index.

Variables	Categories (score)		
Smoking	Non-smoker (1)	Ex-smoker (0)	Current smoker (0)
Alcohol consumption	Non-drinker (1)	Ex-drinker (1)	
	Current drinker : 1-4 go*/time (1)		≥ 5 go/time (0)
Body Mass Index	<19.8 kg/m ² (0)	19.8-24.2 kg/m ² (1)	>24.2 kg/m ² (0)
Sleeping hours	<7 hr/day (0)	7-8 hr/day (1)	>8hr/day (0)
Physical exercise	≥ 3 hr/week (1)	<3hr/week (0)	
Eating breakfast	Almost everyday (1)	Not eating almost everyday (0)	
Eating snacks	0-2 time/week (1)	≥ 3 time/week (0)	

* A go is a traditional unit in Japan, approximately 180ml of sake, containing 30 g of ethanol.

Table 2. Number of study subjects by education, age, sex.

Age	N	Junior high school % (mean age)	High school % (mean age)	College or more % (mean age)
Men (mean age)				
40-49 (44.2y)	4,672	37.3% (44.4y)	50.7% (44.2y)	12.1% (43.9y)
50-59 (54.9)	4,138	58.1 (55.1)	35.7 (54.6y)	6.3 (54.2y)
60-69 (64.5)	6,766	68.8 (64.5)	24.2 (64.4y)	7.0 (65.1y)
70-79 (73.8)	2,992	72.4 (73.8)	19.3 (73.8y)	8.3 (73.3y)
Total (58.8)	18,568	59.1 (61.1)	32.6 (55.0y)	8.3 (56.8y)
Women (mean age)				
40-49 (44.3y)	3,483	27.1% (44.6y)	57.9% (44.3y)	15.0% (43.9y)
50-59 (55.0)	4,059	48.9 (55.4)	42.0 (54.8)	9.1 (54.9)
60-69 (64.2)	5,617	61.9 (64.3)	30.6 (64.1)	7.4 (64.2)
70-79 (74.0)	2,748	71.9 (74.1)	21.2 (74.0)	6.9 (73.5)
Total (59.2)	15,907	52.7 (62.3)	37.9 (55.8)	9.4 (56.0)

Alcohol consumption (Table 3)

Fewer men who completed only junior high school were current drinkers and more men who completed high school were current drinkers. Significant differences were found in the 40-49 age group ($p < 0.05$), the 50-59 age group ($p < 0.01$), and the 70-79 age group ($p < 0.05$).

More women who completed college (except those in the 70-79 age group) were current drinkers than in the other education groups (Table 3). Significant differences were found in the 40-49 age group ($p < 0.0001$) and the 50-59 age group ($p < 0.05$).

BMI (Table 4)

Men in the higher education groups had a higher BMI. Except those in the 40-49 age group, fewer men in the higher education groups had a normal BMI, and more men who completed only junior high school had a normal BMI than in the other education groups.

More women in the higher education groups had a normal BMI and fewer had a high BMI; that is, fewer women were overweight. This difference was significant in all age groups ($p < 0.0001$).

Sleeping hours (Table 4)

For men, sleeping hours were significantly associated with education level ($p < 0.0001$). The higher education groups had fewer people who slept more than 8 hours and more people who slept less than 7 hours. The same association was also observed for women ($p < 0.0001$), except those in the 40-49 age group.

Physical exercise (Table 5)

In the 40-49 and 50-59 age groups, significantly more men with a higher education exercised three hours or more per week ($p < 0.0001$). The same association was also observed for women. In the 60-69 age group, more men who completed high school and fewer who completed only junior high school

exercised three hours or more ($p < 0.0001$).

Eating breakfast and snacks (Table 5)

Significantly more men (except those in the 40-49 age group) with a lower education ate breakfast every day, especially in the 50-59 age group ($p < 0.05$). More women in the 40-49 and the 60-69 age groups with a higher education ate breakfast every day, especially in the 40-49 age group ($p < 0.0001$). In contrast, in the 50-59 age group, those who completed high school ate breakfast every day most frequently and college graduates ate breakfast every day least frequently ($p < 0.05$).

There was no relationship with education level of men for snack consumption. In the 40-49 and 50-59 age groups, women who completed high school snacked the least, and women who completed only junior high school snacked the most ($p < 0.0001$). In the 60-69 age group, women who completed high school snacked less, and college graduates snacked the most ($p < 0.05$). In the 70-79 age group, women in the higher education groups had the fewest snacks ($p < 0.05$).

Health Practices Index (Table 6)

Among men (except those aged 70-79), there was no significant relationship between HPI and education level. Among women in the 40-49 and 60-69 age groups, the higher education groups had a significantly higher HPI ($p < 0.0001$). Although statistically significant, the difference between the highest and lowest HPIs was not so large (4.3 vs. 4.5 in 40-49 age group; 4.5 vs. 4.7 in 60-69 age group). The other age groups had no relationship between HPI and education level.

DISCUSSION

We examined the relationship between health practices and education level in adult subjects older than 40 years who live in an agricultural district in Japan. The frequencies of health

Table 3. Percentage, p-value (χ^2 -test) of smoking and alcohol consumption by education, age, sex.

Variables	Age	Categories	Junior high school	High school	College or more	p-value
Men						
Smoking	40-49	Non-smoker	16.8	15.5	16.8	0.003
		Ex-smoker	13.6	15.7	20.2	
		Current smoker	79.6	68.8	62.9	
	50-59	Non-smoker	23.3	23.2	21.2	0.360
		Ex-smoker	18.5	20.1	23.2	
		Current smoker	58.2	56.6	55.6	
	60-69	Non-smoker	18.6	16.5	15.5	<0.001
		Ex-smoker	28.8	34.0	46.0	
		Current smoker	52.6	49.5	38.6	
	70-	Non-smoker	17.0	20.3	14.1	0.090
		Ex-smoker	43.3	43.0	49.6	
		Current smoker	39.7	36.7	36.3	
Alcohol Consumption	40-49	Non-drinking	15.5	12.4	12.9	0.032
		Ex-drinking	5.3	4.6	5.7	
		Current drinking	79.2	83.0	81.4	
	50-59	Non-drinking	14.9	13.9	18.5	0.009
		Ex-drinking	8.4	6.1	5.0	
		Current drinking	76.7	80.0	76.5	
	60-69	Non-drinking	17.1	16.1	16.9	0.872
		Ex-drinking	12.6	12.3	11.9	
		Current drinking	70.3	71.5	71.2	
	70-	Non-drinking	22.5	16.6	20.6	0.046
		Ex-drinking	22.0	22.5	22.2	
		Current drinking	55.6	60.8	57.3	
Women						
Smoking	40-49	Non-smoker	76.7	85.2	84.6	<0.001
		Ex-smoker	3.1	2.4	3.4	
		Current smoker	20.6	12.4	12.0	
	50-59	Non-smoker	88.4	90.9	86.8	0.019
		Ex-smoker	1.8	1.7	3.2	
		Current smoker	9.8	7.4	10.0	
	60-69	Non-smoker	92.2	94.0	92.6	0.101
		Ex-smoker	2.2	2.0	2.9	
		Current smoker	5.6	4.0	4.6	
	70-	Non-smoker	89.1	91.1	93.2	0.243
		Ex-smoker	4.1	3.3	3.7	
		Current smoker	6.8	5.7	3.2	
Alcohol Consumption	40-49	Non-drinking	56.3	60.6	53.8	<0.001
		Ex-drinking	7.2	4.0	4.8	
		Current drinking	36.5	35.4	41.4	
	50-59	Non-drinking	70.3	70.1	63.2	0.036
		Ex-drinking	4.7	3.8	5.1	
		Current drinking	24.9	26.1	31.6	
	60-69	Non-drinking	79.2	79.5	78.7	0.226
		Ex-drinking	4.3	3.5	2.4	
		Current drinking	16.5	17.0	18.9	
	70-	Non-drinking	83.0	83.7	85.8	0.291
		Ex-drinking	5.5	3.6	3.7	
		Current drinking	11.5	12.7	10.5	

Table 4. Percentage, p-value (χ^2 -test) of Body Mass Index and Sleeping hours by education, age, sex.

Education, age, sex.						
Variables	Age	Categories	Junior high school	High school	College or more	p-value
Men						
BMI	40-49	<19.8	8.9	7.0	6.7	0.053
		19.8-24.2	51.1	52.0	50.7	
		>24.2	40.0	40.9	43.6	
	50-59	<19.8	6.4	6.1	5.0	0.117
		19.8-24.2	53.8	52.2	46.7	
		>24.2	39.8	41.7	48.3	
	60-69	<19.8	10.3	10.6	11.0	0.640
		19.8-24.2	56.1	54.7	52.8	
		>24.2	33.6	34.7	36.2	
	70-	<19.8	16.1	18.5	16.9	0.202
		19.8-24.2	59.0	56.7	52.8	
		>24.2	24.9	24.8	30.2	
Sleeping hours (hr/day)	40-49	<7	13.9	16.0	18.6	<0.001
		7-8	76.2	77.8	76.6	
		>8	9.9	6.2	4.8	
	50-59	<7	11.1	15.2	18.5	<0.001
		7-8	72.6	72.6	74.5	
		>8	16.3	12.2	7.0	
	60-69	<7	9.0	13.7	16.5	<0.001
		7-8	64.8	67.8	72.7	
		>8	26.2	18.5	10.8	
	70-	<7	10.7	12.1	15.7	<0.001
		7-8	52.9	65.5	69.0	
		>8	36.4	22.4	15.3	
Women						
BMI	40-49	<19.8	8.6	8.8	12.6	<0.001
		19.8-24.2	50.4	57.0	61.6	
		>24.2	41.0	34.2	25.8	
	50-59	<19.8	6.4	8.5	7.6	<0.001
		19.8-24.2	46.1	51.5	55.4	
		>24.2	47.5	40.0	37.0	
	60-69	<19.8	9.1	9.7	9.3	0.001
		19.8-24.2	44.3	49.9	51.6	
		>24.2	46.6	40.4	39.1	
	70-	<19.8	15.8	19.4	19.5	0.001
		19.8-24.2	43.8	49.3	47.9	
		>24.2	40.4	31.3	32.6	
Sleeping hours (hr/day)	40-49	<7	27.4	27.0	30.7	<0.001
		7-8	66.4	70.5	65.8	
		>8	6.2	2.5	3.4	
	50-59	<7	18.8	22.1	31.6	<0.001
		7-8	71.2	71.1	61.6	
		>8	10.0	6.9	6.8	
	60-69	<7	16.1	21.4	23.0	<0.001
		7-8	67.4	68.6	70.3	
		>8	16.4	9.9	6.7	
	70-	<7	13.5	18.4	21.6	<0.001
		7-8	53.0	60.5	62.1	
		>8	33.5	21.1	16.3	

Table 5. Percentage, p-value (χ^2 -test) of physical exercise, eating breakfast and snaking by education, age, sex.

Variables	Age	Junior high school	High school	College or more	p-value
Men					
Physical exercise (≥ 3 hr/week)	40-49	5.9	7.9	11.3	<0.001
	50-59	7.3	8.1	18.1	<0.001
	60-69	17.3	22.4	22.2	<0.001
	70-	30.8	28.6	26.6	0.283
Eating breakfast (Almost every day)	40-49	86.3	86.8	85.1	0.554
	50-59	95.0	93.8	91.5	0.029
	60-69	98.0	97.5	97.7	0.455
	70-	99.0	98.4	98.0	0.267
Eating snacks (0-2/week)	40-49	68.8	68.4	71.8	0.277
	50-59	68.4	66.3	66.8	0.404
	60-69	64.3	63.2	60.4	0.212
	70-	56.6	58.8	51.6	0.165
Women					
Physical exercise (≥ 3 hr/week)	40-49	3.8	4.4	7.4	0.004
	50-59	6.4	9.5	10.3	0.001
	60-69	14.6	14.6	17.6	0.191
	70-	14.4	12.9	13.2	0.605
Eating breakfast (Almost every day)	40-49	85.2	90.0	90.8	<0.001
	50-59	94.2	94.7	91.1	0.030
	60-69	97.6	97.8	98.3	0.640
	70-	98.3	98.1	96.8	0.373
Eating snacks (0-2/week)	40-49	45.1	36.0	38.9	<0.001
	50-59	38.3	31.8	33.2	<0.001
	60-69	37.4	35.4	42.0	0.041
	70-	39.2	35.6	31.1	0.039

Table 6. Health Practice Index.

Age	Junior high school	High school	College or more	p-value*
Men				
40-49	4.0 $\pm$ 1.03	4.1 $\pm$ 1.02	4.1 $\pm$ 1.05	0.105
50-59	4.2 $\pm$ 1.00	4.1 $\pm$ 1.01	4.2 $\pm$ 0.98	0.279
60-69	4.2 $\pm$ 1.01	4.2 $\pm$ 1.04	4.2 $\pm$ 1.07	0.585
70-	4.2 $\pm$ 1.10	4.3 $\pm$ 1.08	4.1 $\pm$ 1.07	0.030
Women				
40-49	4.3 $\pm$ 1.10	4.4 $\pm$ 1.00	4.5 $\pm$ 1.03	<0.001
50-59	4.4 $\pm$ 0.95	4.5 $\pm$ 0.99	4.4 $\pm$ 1.01	0.073
60-69	4.5 $\pm$ 0.97	4.6 $\pm$ 0.97	4.7 $\pm$ 1.03	<0.001
70-	4.4 $\pm$ 0.99	4.5 $\pm$ 0.98	4.4 $\pm$ 0.95	0.098

* Tested with ANOVA

practices by age group were consistent with the results of other large-scale, population-based cohort studies in Japan ^{24,25}.

The results indicate that higher education is significantly associated with shorter sleeping hours for both men and women. In the age groups younger than 70 years, significantly more people with a higher education tended to exercise three hours or more per week. Alcohol consumption and HPI were not associated with education level. Smoking for men and BMI for women were associated with education level but smoking for women and BMI for men were not associated. These

results are remarkably different from those from Europe and the USA ^{26,27}.

A significant relationship between smoking and education level was found only among men in their forties and sixties and women in their forties. Among women in their fifties, most smokers were college graduates. Studies in the West indicate that people with higher education are significantly less likely to be smokers men and women ^{6,8}. Thus the relationship between smoking and education level is weaker in Japan than in Western countries.

Men who completed only junior high school were less likely to be drinkers. Women with a higher education were more likely to be drinkers, except those in their seventies. However, Western studies have found a negative correlation between alcohol consumption and years of education. Especially, heavy drinking had the association a lower education level^{9,10}.

There was no relationship between HPI and education level of men, except for men in their seventies. Among women in their forties and sixties, those with a higher education had a significantly higher HPI. Although statistically significant, the difference in HPI was only marginal (Table 6).

In summary, the relationship between health practices and education level is weaker in Japan than in Europe and the USA. There is no clear explanation for this. However, our results could have some implications. First, our findings could be interpreted to mean that formal education in Japan fails to provide effective physical education. We need to reinforce physical education to prevent students from adopting poor health habits such as smoking. Second, our results suggest us that education level is not an appropriate proxy for SES in Japan. This notion is supported by the fact that income difference by education level is small in Japan¹⁵⁻¹⁷. Many epidemiological studies include education level in multivariate models to control for the effect of SES on health-related outcomes. Our results suggest that, in the Japanese population, adding education level to statistical analyses would bring only a small gain.

This study deals with people in a rural area in the northern part of Japan where the education level is lower than the national average. The subjects are mainly farmers or the self-employed. Therefore, our findings may not apply to residents in an urban area of Japan. Another limitation in this study is that only 34,475 out of 52,029 original subjects responded to all questions and were analyzed. Thus, the selection bias due to omitting no complete responders should be taken into account. It is necessary to investigate other populations to test the generalizability of our findings. It is also important to identify the factors responsible for the difference between Japan and the West in the relationship between health practices and education level.

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