KNOWLEDGE OF SMOKING-RELATED RISKS AND OPINIONS ON TOBACCO CONTROL BY SMOKING STATUS AND EDUCATION LEVEL IN JAPAN

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Objective We aimed to examine knowledge of smoking-related risks and opinions on tobacco control by smoking status and education level in Japan.

Methods We conducted a questionnaire survey in 2002 on a random sample of residents aged 20 to 79 years in two neighboring districts of northern Japan. In a total sample of 7,136, we analyzed data from 5,638 (79.0%) subjects (2,659 men and 2,979 women).

Results The length of education was positively associated with knowledge of smoking-related risks. Compared to current smokers, past male smokers and never female smokers were more likely to know about the harm of passive smoking. As for causal links between smoking and lung cancer, stroke, and low birth weight, those who had been educated longer tended to be more aware of the associations in both sexes. Compared to current smokers, past and never smokers of men and past smokers of women were more likely to know that smoking contributes to low birth weight, but no difference was observed between current and never female smokers in this regard. Opinions on tobacco control were associated with both smoking status and education level; past and never smokers compared to current smokers and those who were educated longer tended to be affirmative about tobacco control.

Conclusion Knowledge of smoking is largely associated with education, but opinions on tobacco control are dependent on both smoking status and education.

Key words: knowledge, opinion, tobacco control, smoking status, education

I. Introduction

The smoking rate for Japanese men (52.0% in 2001) has gradually decreased, but Japan still ranks high for smoking among developed countries[1]. Furthermore, the smoking rate of Japanese women in their 20's and 30's has been increasing in recent years though the prevalence in Japanese females overall (14.7% in 2001) is still ranked low compared to the Western world[1]. Smoking is one of the main targets of Healthy Japan 21[2], which started in 2000, and action plans are being developed in communities, workplaces, and schools. Smoking cessation should be encouraged through both health promotion campaigns and health education programs. In 2002 we planned a controlled community intervention trial for smoking cessation in Iwate Prefecture. The smoking rate in the Prefecture has been shown to be as high as the Japanese national average for men (standardized smoking prevalence ratio: 1.01 with 95% confidence intervals from 0.88 to 1.15), and lower than the Japanese national average for women (0.46, from 0.31 to 0.68)[3]. Before starting the trial, we carried out a baseline questionnaire survey using a randomly selected sample of residents.

Knowledge of smoking-related risks has been shown to be associated with smoking status and education level; current smokers and less educated people tend to underestimate their risks of developing smoking-related diseases[4,5]. Links between knowledge of smoking-related risks and smoking status

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have been also confirmed in Japan among students in medicine[6] or allied health sciences[7]. However, the relationship between knowledge of smoking-related risks and education level has not been clarified in detail in Japan. In addition, opinions on tobacco control are reported to be associated with smoking status in a U.S. national survey[8], but few studies have been conducted on the association with education level. In this report we document findings for knowledge of smoking-related risks and opinions on tobacco control with regard to smoking status and education level.

II. Methods

Study design

This study was planned in 2002. We selected two districts in the northeastern part of Iwate Prefecture as the study area. One district, named Kuji, is located north of the other district, named Miyako. We designated three out of 7 municipalities in Miyako District as intervention areas and 4 out of 6 municipalities in Kuji District as control areas. By incorporating the names of municipalities in intervention areas, this study was called the Health Center Based Smoking Cessation in Iwaizumi Town, Niisato Village, and Taro Town (HINT) Study. Among the 7 municipalities selected for the trial, 3 (1 for the intervention and 2 for the control) were coastal and 4 (2 for the intervention and 2 for the control) were inland.

Two questionnaire surveys using the same subjects for evaluation of the trial were planned: a baseline questionnaire survey in 2002 and an evaluation questionnaire survey in 2004. We calculated the sample size based on average prevalence of those who had quit smoking. We expected that this proportion would be about 20% in the baseline survey and would increase to about 40% in the intervention area and to about 36% in the control area. With an alpha error of 5% and beta error of 20%, we estimated that 2,311 subjects would be necessary in each area. Expecting the response rate to be about 80%, it was estimated that a sample size of at least 5,800 would be needed in order to obtain 4,640 responses.

The baseline questionnaire survey was carried out from February to June in 2002. First, we conducted a pilot study for the feasibility of the main study. We chose 50 persons at the top of the telephone directory in two municipalities of Iwate Prefecture, and sent them the same questionnaire as the main study. We received 37 responses and as we found that 2 persons on the list had moved, the response rate was 77.1% (37/48). For the main study, a total of 7,136 subjects, aged 20 to 79 years, were randomly selected from the Basic Resident Registers for each of the 7 municipalities. In one municipality (Iwaizumi Town) subjects were randomly selected from those aged 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 69, 74 and 79 years. A questionnaire with a letter explaining the objective of the survey was sent to each subject. Written informed consent for participation was obtained from the subjects with the questionnaire so that we could reach the same subjects during the evaluation survey. Reminder letters were sent to subjects once or twice. We sent respondents a coupon for 500 yen or stationery as a reward for completing the survey. Respondents were requested to provide missing information in the questionnaire by mail or by telephone. As a result, we obtained 5,676 responses (response rate: 79.5%).

Questionnaire

Areas covered by the questionnaire were: 1) psychosocial factors, including marital status, live-alone, education, community participation, and financial situation; 2) lifestyle parameters, including smoking, drinking, diet, and exercise; 3) knowledge of smoking and opinions on tobacco control; and 4) the Japanese version of the Self-Rating Depression Scale (SDS).[9,10] Knowledge of smoking-related risks was analyzed on the following items: passive smoking is harmful (passive smoking); tobacco produces dependence (tobacco dependence); tobacco smoke contains carbon monoxide (carbon monoxide); and cigarettes are a leading source of accidental ingestion of poisons among infants (cause of accidental ingestion). Knowledge of the associations with smoking was analyzed on the following items: lung cancer; stroke; low birth weight; and alveolar pyorrhea. Opinions on tobacco control were analyzed through the following statements: "minors should abstain from smoking" (prohibition for minors); "are you in favor of an anti-smoking movement?" (anti-smoking movement); "are you in favor of smoking-area restriction in public space?" (smoking-area restriction); and "a poster campaign for smoking cessation is necessary" (poster campaign).

Data from 5,638 (79.0%) subjects, 2,931 men and 2,707 women, were used for the analyses. Numbers of samples, numbers of subjects, and response rates (numbers of subjects divided by numbers of samples) by sex and age group (20 to 39, 40 to 49, 50 to 59, 60 to 69 and 70 to 79) are shown in Table 1. Response rates were lower in younger age groups in both sexes, and were higher in the intervention area than in the control area in all sex and age groups. The percentages of older subjects were

Table 1. Numbers of samples, numbers of subjects, and response rates by sex and age group in the intervention and control areas.

	Men					Women					Total				
	Samples		Subjects		Response rate (%)	Samples		Subjects		Response rate (%)	Samples		Subjects		Response rate (%)
	n	%	n	%		n	%	n	%		n	%	n	%	
Intervention area															
20–39 years	381	22.3	255	18.4	66.9	397	21.6	307	19.8	77.3	778	21.9	562	19.2	72.2
40–49	361	21.1	282	20.4	78.1	288	15.6	240	15.5	83.3	649	18.3	522	17.8	80.4
50–59	324	18.9	265	19.1	81.8	321	17.4	279	18.0	86.9	645	18.1	544	18.6	84.3
60–69	392	22.9	355	25.7	90.6	498	27.0	435	28.1	87.3	890	25.0	790	27.0	88.8
70–79	254	14.8	227	16.4	89.4	338	18.3	286	18.5	84.6	592	16.7	513	17.5	86.7
Total	1,712	100.0	1,384	100.0	80.8	1,842	100.0	1,547	100.0	84.0	3,554	100.0	2,931	100.0	82.5
Control area															
20–39	522	30.0	330	25.9	63.2	508	27.6	361	25.2	71.1	1,030	28.8	691	25.5	67.1
40–49	372	21.4	266	20.9	71.5	355	19.3	279	19.5	78.6	727	20.3	545	20.1	75.0
50–59	340	19.5	263	20.6	77.4	347	18.8	280	19.6	80.7	687	19.2	543	20.1	79.0
60–69	289	16.6	230	18.0	79.6	384	20.8	316	22.1	82.3	673	18.8	546	20.2	81.1
70–79	217	12.5	186	14.6	85.7	248	13.5	196	13.7	79.0	465	13.0	382	14.1	82.2
Total	1,740	100.0	1,275	100.0	73.3	1,842	100.0	1,432	100.0	77.7	3,582	100.0	2,707	100.0	75.6
Total															
20–39	903	26.2	585	22.0	64.8	905	24.6	668	22.4	73.8	1,808	25.3	1,253	22.2	69.3
40–49	733	21.2	548	20.6	74.8	643	17.5	519	17.4	80.7	1,376	19.3	1,067	18.9	77.5
50–59	664	19.2	528	19.9	79.5	668	18.1	559	18.8	83.7	1,332	18.7	1,087	19.3	81.6
60–69	681	19.7	585	22.0	85.9	882	23.9	751	25.2	85.1	1,563	21.9	1,336	23.7	85.5
70–79	471	13.6	413	15.5	87.7	586	15.9	482	16.2	82.3	1,057	14.8	895	15.9	84.7
Total	3,452	100.0	2,659	100.0	77.0	3,684	100.0	2,979	100.0	80.9	7,136	100.0	5,638	100.0	79.0

higher in the intervention area than in the control area.

Statistical analysis

Logistic regression analyses were used to examine the effects of smoking status and education level on knowledge of smoking-related risks and opinions on tobacco control. Smoking status was categorized into current, past and never smokers, and education level was categorized into 9 years or less, 10 to 12 years, and 13 years and more. Age-adjusted odds ratios and 95% confidence intervals (95% C.I.s) were calculated by including the following items in the models: smoking status (model 1), education level (model 2), and smoking status and education level (model 3). Tests of significance for odds ratios were performed using a likelihood ratio test. SPSS 11.0 J was used for all statistical analyses.

The Ethics Committee of Iwate Medical University approved the conduct of this study.

III. Results

The mean age (±SD) was significantly higher in the intervention area than in the control area in both sexes ($P<0.001$): 53.3±15.8 and 50.6±15.9 in men and 54.4±16.2 and 51.3±15.8 in women. Age-adjusted prevalences of nonsmokers and current smokers by age group in the intervention and control areas are shown for men and women in Figure 1. Around 60% of men younger than 50 years and nearly 20% of women younger than 40 years were current smokers both in the intervention area and the control area. Overall the prevalence of current smokers was not significantly different between the intervention area and the control area in either sex: 48.9% and 48.8% in men and 8.2% and 9.2% in women, respectively.

Prevalence of current smokers was not significantly different among three groups of education levels in men ($P=0.523$ by logistic regression analysis adjusting for age). Age-adjusted prevalence of never, past, and current smokers were 30.8%, 23.7%, and 45.5% for men with education of 9 years or less, 25.2%, 21.9%, and 52.9% for men with education of 10 to 12 years, and 26.1%, 26.1%, and 47.9% for men with education of 13 years or more, respectively. Prevalence of current smokers was not significantly different among the three groups of education levels in women, either ($P=0.438$ by logistic regression analysis adjusting for age). Age-adjusted prevalences of never, past, and current smokers were 89.9%, 3.3%, and 6.8% for women with an educa-

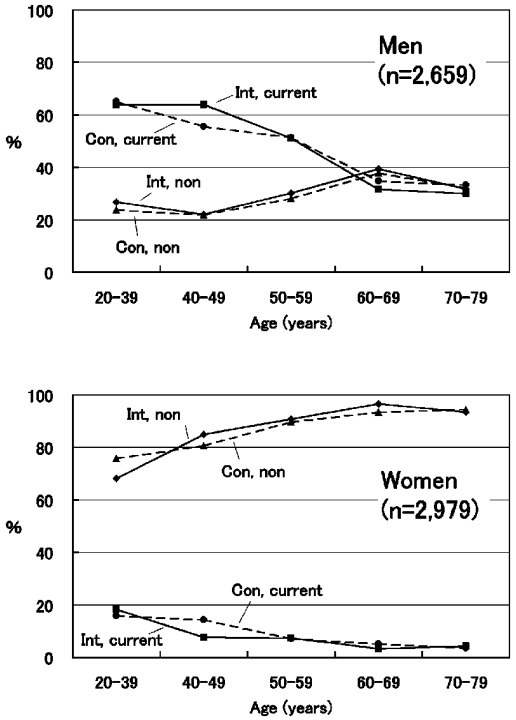

Figure 1. Prevalence (%) of non and current smokers by age group and sex in the intervention and control areas (int: the intervention area, and con: the control area)

tion of 9 years or less, 84.6%, 5.0%, and 10.4% for women with an education of 10 to 12 years, and 78.6%, 7.7%, and 13.8% for women with an education of 13 years or more, respectively.

Prevalence and odds ratios (95% confidence intervals) for knowledge of smoking-related risks by smoking status and education level are shown in Table 2. About 90% of the subjects (88.4% of men and 91.9% of women) had knowledge about harm of passive smoking, whereas only about 35% of the subjects (33.8% of men and 36.6% of women) knew that cigarettes are a cause of accidental ingestion of harmful material. As odds ratios in model 1 and model 3 for smoking status and those in model 2 and model 3 for education level did not essentially differ, only the results of model 3 are shown in Table 2 (when the district was considered in the model, no substantial difference was observed in the results). Compared to current smokers, past male smokers and never female smokers were more likely to know that passive smoking is harmful. However, compared to current smokers, never male smokers were less likely to have knowledge of tobacco dependence. As for education level, those who were educated longer were more likely to know about harm of passive smoking, tobacco dependence, and carbon monoxide contained in smoke in both sexes and a cigarette being a cause of accidental ingestion in women.

Prevalence and odds ratios (95% confidence intervals) for knowledge about associations with smoking by smoking status and education level are shown in Table 3. More than 90% of the subjects (91.0% of men and 92.8% of women) knew that smoking is associated with lung cancer, whereas only about 17% of the subjects (16.7% of men and 17.8% of women) knew that smoking is associated with alveolar pyorrhoea. The percentage of those who knew that smoking is associated with low birth weight was significantly lower in men than in women ($P<0.001$ by logistic regression analysis adjusting for age): 22.5% and 44.7%, respectively. As odds ratios in model 1 and model 3 for smoking status and those in model 2 and model 3 for education level did not essentially differ, only the results of model 3 are shown in Table 3 (when the district was considered in the model, no substantial difference was observed in the results). Compared to current smokers, past smokers and never smokers of men were more likely to know that smoking is associated with low birth weight, while never male smokers were less likely to know that smoking is associated with stroke and past and never male smokers were less likely to know that smoking is associated with alveolar pyorrhoea. Never male smokers were also less likely to know that smoking is associated with lung cancer though there was no statistical significance. Compared to current smokers, past female smokers were more likely to know that smoking is associated with low birth weight. As for education level, those who had higher education were more likely to know the association of smoking with lung cancer, stroke, and low birth weight in both sexes and the association with alveolar pyhorrhoea in women.

Prevalence data and odds ratios (95% confidence intervals) for opinions on tobacco control by smoking status and education level are shown in Table 4. More than 70% of the subjects were in favor of prohibition for minors and smoking-area restrictions. Percentages of those who were in favor of tobacco control in these four items were higher in women than in men ($P<0.001$ by logistic regression analysis adjusting for age). As odds ratios in model 1 and model 3 for smoking status and those in model 2 and model 3 for education level did not essentially differ, only the results of model 3 are shown in Table 4 (when the district was considered in the model, no substantial difference was observed in the results). Compared to current smokers, past smokers and never smokers of men and women were more in favor of prohibition for minors, anti-smoking move-

Table 2. Prevalences and odds ratios* (95% CIs) for knowledge of smoking-related risks by smoking status and education level

	Harm of passive smoking	Tobacco dependence	Carbon monoxide in smoke	Cause of accidental ingestion
Men (n=2,659)				
Prevalence (%)	88.4	79.9	42.2	33.8
Smoking				
Current	1.00	1.00	1.00	1.00
Past	1.89(1.33–2.68)	1.11(0.84–1.47)	1.05(0.86–1.23)	1.19(0.96–1.48)
Never	1.17(0.88–1.55)	0.54(0.43–0.68)	0.85(0.70–1.02)	0.89(0.73–1.08)
$P^{\dagger}$	0.001	<0.001	0.10	0.046
Education				
–9 years	1.00	1.00	1.00	1.00
10–12	1.42(1.04–1.93)	1.47(1.16–1.88)	1.38(1.13–1.68)	1.02(0.83–1.25)
13–	1.58(1.08–2.32)	2.72(1.94–3.80)	1.85(1.47–2.33)	0.92(0.72–1.16)
$P^{\dagger}$	<0.001	<0.001	<0.001	<0.001
P for trend	0.01	<0.001	<0.001	0.52
Women (n=2,979)				
Prevalence (%)	91.9	72.2	37.9	36.6
Smoking				
Current	1.00	1.00	1.00	1.00
Past	1.10(0.50–2.44)	1.01(0.59–1.72)	1.17(0.75–1.83)	1.30(0.84–2.00)
Never	2.02(1.25–3.24)	0.86(0.62–1.19)	1.35(1.01–1.79)	1.23(0.93–1.62)
$P^{\dagger}$	0.01	0.54	0.10	0.30
Education				
–9 years	1.00	1.00	1.00	1.00
10–12	3.21(2.10–4.92)	2.56(2.04–3.21)	1.25(1.02–1.52)	1.28(1.05–1.56)
13–	6.22(2.99–12.92)	4.19(3.03–5.78)	1.96(1.53–2.51)	1.47(1.15–1.88)
$P^{\dagger}$	<0.001	<0.001	<0.001	<0.001
P for trend	<0.001	<0.001	<0.001	0.001

* Odds ratios calculated by including age, smoking and education simultaneously (model 3) are shown.
† *P* values calculated by likelihood ratio test (*P* for trend is also shown for education).

ments, smoking-area restrictions, and poster campaigns, except for past female smokers for prohibition for minors. As for education level, compared to men with an education of 9 years of less, men with an education of 13 years or more were more likely to be in favor of prohibition for minors and anti-smoking movements, and men with education of 10 to 12 years, and 13 years or more were more likely to be in favor of smoking-area restrictions. Compared to women with education of 9 years or less, women with education of 10 to 12 years and 13 years or more were more likely to be in favor of prohibition for minors, anti-smoking movements, smoking-area restrictions, and poster campaigns.

IV. Discussion

This study was based on a random sample large-scale questionnaire survey with a nearly 80% response rate. The results can be summarized as: 1) knowledge of smoking is mainly associated with education level; and 2) opinions on tobacco control are associated with both smoking status and education level. In our study, however, prevalence of current smokers was not significantly different by education level in either sex, despite the fact that associations between smoking status and education level have been found not only in the U.S.[11] and European countries[12] but also in Japan[13~15].

The proportions of those who knew that smoking causes lung cancer, bronchitis, stroke, and alveolar pyorrhea (periodontal disease) were similar to those reported in the study by Sonoda and Mori[16] (94.9%, 58.1%, 28.9%, and 20.5%, respectively). The risk of lung cancer had been perceived as the highest[6,16], and our findings were consistent in this

Table 3. Prevalences and odds ratios* (95% CIs) for knowledge of associations with smoking by smoking status and education level

	Lung cancer	Stroke	Low birth weight	Alveolar pyorrhoea
Men (n=2,659)				
Prevalence (%)	91.0	29.8	22.5	16.7
Smoking				
Current	1.00	1.00	1.00	1.00
Past	1.23(0.84–1.79)	0.87(0.70–1.09)	1.35(1.05–1.75)	0.74(0.55–0.98)
Never	0.84(0.61–1.16)	0.63(0.52–0.78)	1.50(1.21–1.87)	0.55(0.43–0.72)
$P^{\dagger}$	0.14	<0.001	0.001	<0.001
Education				
–9 years	1.00	1.00	1.00	1.00
10–12	2.17(1.50–3.13)	1.18(0.96–1.46)	1.63(1.29–2.06)	1.20(0.93–1.56)
13–	2.88(1.73–4.77)	1.49(1.17–1.90)	1.61(1.24–2.11)	1.13(0.84–1.52)
$P^{\dagger}$	<0.001	<0.001	<0.001	0.001
P for trend	<0.001	0.001	<0.001	0.39
Women (n=2,979)				
Prevalence (%)	92.8	26.6	44.7	17.8
Smoking				
Current	1.00	1.00	1.00	1.00
Past	0.84(0.34–2.06)	1.00(0.63–1.57)	1.65(1.04–2.63)	1.11(0.69–1.78)
Never	1.20(0.68–2.11)	0.85(0.64–1.13)	1.10(0.83–1.46)	0.81(0.59–1.10)
$P^{\dagger}$	0.58	0.42	0.09	0.16
Education				
–9 years	1.00	1.00	1.00	1.00
10–12	2.98(1.92–4.63)	1.57(1.27–1.95)	2.17(1.78–2.64)	1.59(1.24–2.05)
13–	5.21(2.58–10.53)	2.28(1.76–2.96)	3.13(2.43–4.03)	1.85(1.38–2.49)
$P^{\dagger}$	<0.001	<0.001	<0.001	<0.001
P for trend	<0.001	<0.001	<0.001	<0.001

* Odds ratios calculated by including age, smoking and education simultaneously (model 3) are shown.

† *P* values calculated by likelihood ratio test (*P* for trend is also shown for education).

respect. Kawakami[6] also revealed that smokers were more likely to underestimate the harm of smoking than current nonsmokers. Our results showed that the risk of stroke for men and that of alveolar pyorrhea for both men and women were perceived slightly but significantly higher among current smokers than among nonsmokers or past smokers. This means that current smokers continue to smoke cigarettes even knowing its association with diseases. Thus, it is necessary to make smokers aware not only about risks of smoking but also about therapeutic measures available to overcome tobacco dependence.

Our study showed that the percentage of those who knew smoking to be a cause of low birth weight was almost two times higher in women than in men (44.7% and 22.5%, respectively), a reasonable finding since Japanese women have many chances to learn about risks of smoking during pregnancy. However, a gender difference was also observed in odds ratios by smoking status; compared to current smokers, never male smokers were more likely to know about the risk of low birth weight, but current female smokers had almost the same level of knowledge as never smokers. When the women were analyzed in two age groups (women aged 20 to 59 years and women aged 60 years or older) separately, the proportions of those who knew the association between smoking and low birth weight showed a marked difference: 59.7% for younger women and 23.6% for older women, respectively. Never smokers were more likely to know the risk of smoking on low birth weight among younger women (odds ratio with 95% confidence intervals: 2.11, 1.26–3.52), but no significant difference between current smokers and never smokers in the knowledge was observed among older women.

Table 4. Prevalences and odds ratios* (95% CIs) for opinions on tobacco control by smoking status and education level

	Prohibition for minors	Anti-smoking movement	Smoking area restriction	Poster campaign
Men (n=2,659)				
Prevalence (%)	70.9	52.9	77.0	60.2
Smoking				
Current	1.00	1.00	1.00	1.00
Past	1.71(1.34-2.18)	2.49(2.01-3.09)	3.47(2.58-4.66)	2.17(1.74-2.70)
Never	1.63(1.32-2.02)	2.36(1.95-2.86)	2.82(2.22-3.59)	2.23(1.83-2.71)
$P^{\dagger}$	<0.001	<0.001	<0.001	<0.001
Education				
-9 years	1.00	1.00	1.00	1.00
10-12	1.00(0.80-1.24)	1.19(0.97-1.46)	1.30(1.03-1.66)	1.03(0.84-1.26)
13-	1.35(1.04-1.75)	1.36(1.07-1.72)	1.68(1.26-2.23)	1.13(0.89-1.44)
$P^{\dagger}$	<0.001	<0.001	<0.001	<0.001
P for trend	0.03	0.01	<0.001	0.32
Women (n=2,979)				
Prevalence (%)	77.2	60.3	81.1	69.6
Smoking				
Current	1.00	1.00	1.00	1.00
Past	1.04(0.68-1.59)	2.13(1.36-3.33)	2.95(1.78-4.88)	2.48(1.62-3.82)
Never	2.84(2.16-3.75)	4.91(3.64-6.62)	4.38(3.28-5.85)	4.64(3.51-6.12)
$P^{\dagger}$	<0.001	<0.001	<0.001	<0.001
Education				
-9 years	1.00	1.00	1.00	1.00
10-12	1.79(1.40-2.29)	1.49(1.21-1.82)	2.45(1.87-3.21)	1.58(1.26-1.96)
13-	2.21(1.64-2.98)	1.76(1.36-2.28)	2.92(2.07-4.12)	1.72(1.31-2.26)
$P^{\dagger}$	<0.001	<0.001	<0.001	<0.001
P for trend	<0.001	<0.001	<0.001	<0.001

* Odds ratios calculated by including age, smoking and education simultaneously (model 3) are shown.
† *P* values calculated by likelihood ratio test (*P* for trend is also shown for education).

Opinions on tobacco control significantly differed across smoking categories, and current smokers were consistently less positive with regard to anti-smoking measures. Three studies have been conducted on attitudes towards restrictive measures in Ontario, Canada. The study conducted in the 1980's[17] showed that non and former smokers were in close agreement and were more restrictive in their attitudes than current smokers, but the other two studies conducted in the 1990's[18,19] revealed that both smokers and nonsmokers agreed with restrictions on smoking in most settings and disagreed only on the extent of restrictions. Our results seem to be similar to those in their first study[17]. This may be because Japan is behind other developed countries in tobacco control policy. In May 2003 the Health Promotion Law started in Japan, and a policy for restriction on smoking was implemented. The Health Promotion Law is expected to support action plans of Healthy Japan 21 for tobacco control.

In our data, no significant difference in prevalence of current smokers by education level was observed in either sex. Nakamura, et al. analyzed data from a large random sample of Japanese population and observed inverse relationships between proportion of current smokers and three socioeconomic factors: occupation, income and education[20]. In their results the proportion of current smokers was higher for those with education of 10 to 12 years than for those with education of 9 years or less in both sexes, to some extent consistent with our results. In our data, however, the proportion of current smokers was even higher for those with education of 13 years or more than for those with education of 10 to12 years in women. Thus, with women, Japan seems to remain at the early stage of cigarette diffusion where

cigarette smoking prevails among the highly educated[21].

Biochemical validation of self-reported smoking status has found that valid responses can be obtained for current smoking in population-based surveys[22]. It is one of the limitations of our study that we did not perform any biochemical validation for smoking. We avoided contacting subjects for fear of intervening in the subjects' smoking status, but did conduct an evaluation survey using the same questionnaire on the same subjects in 2004 after a community intervention.

The difference in response rates is another limitation. Response rates were lower in younger age groups, especially in men aged 20 to 39 years. This may be because younger subjects are more likely to smoke than older subjects, especially in men, and are unwilling to answer smoking related questions. This could induce a selection bias that only cooperative or knowledgeable subjects among young current smokers responded. However, this selection bias would be expected to dilute differences in knowledge or opinions, and it is thus unlikely that our results were unduly influenced by low response rates among young subjects. In addition, the response rate in the control area was lower than in the intervention area. We sent the questionnaire with a letter explaining its purpose, how the subject was chosen, confidentiality, and how we planned to utilize the results. Both the mayor of each municipality and a professor of a university, one of our study team, signed the letter, and the contact persons of the municipality and the university were specified. In one municipality in the control area with the lowest response rate, however, only the professor of the university signed the letter and only a contact person at the university was specified. This might be the reason for the low response rate in this municipality, and consequently the low response rate in the control area.

In conclusion, knowledge of smoking was found to be mainly associated with education, while opinions on tobacco control were linked with both smoking status and education. Japan is behind other developed countries in tobacco control policy. Smoking cessation should be encouraged through both health promotion campaigns and health education programs.

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