

ORIGINAL ARTICLE

An epidemiological study on the effectiveness of workplace smoking control programs

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Abstract. The workplace is an important field for smoking control, but there are relatively few reports on the current situation of workplace smoking control with the exception of reports from North-American countries. The aim of this study was to evaluate the effectiveness of workplace smoking control programs on the smoking prevalence among Japanese workers. A self-administered questionnaire regarding workplace smoking control programs was sent to 531 workplaces and a total of 315 workplaces returned the questionnaire. The number of employees in the study sample was 57,051 males and 19,818 females. The restriction of smoking area and/or time was found to be associated with a 13.1% and 44.5% decrease in smoking prevalence for males and females, respectively. The data were also analyzed, restricting to the workers in manufacturing industry which constituted the largest part of workers, in order to control a possible confounding arising from different characteristics among different industries. Restriction of smoking area and/or smoking time gave the largest effects of 15.4% and 36.2% lower prevalence in males and females, respectively. The differences observed in all female workers combined for individual consultation for smokers were also identified. In conclusion, it is suggested that workplace smoking control programs are effective at lowering the prevalence of workers who smoke. (Keio J Med 52 (1): 30–37, March 2003)

Key words: Smoking control, smoking prevalence, workplace, epidemiology

Introduction

According to the National Tobacco and Health Survey conducted in 1999, the smoking rate among adults in Japan was 52.8% for males and 13.4% for females.¹ The smoking prevalence among Japanese males is higher than the world average (47%), estimated by the survey of the World Health Organization, ranking top tenth among 87 countries, while the smoking prevalence among females is close to the world average (12%), ranking 49th among 86 countries.² The smoking prevalence among males shows a decreasing tendency, while that among females shows an increasing tendency.

Cancer is the top leading cause of death in Japan. In particular, regarding sites, lung cancer causes the highest death rate in males and the third highest in females.³ According to our study on the quantitative relationship between cumulative cigarette consumption and lung cancer mortality, the cumulative cigarette

consumption increased in all ages of both sexes, which in turn raised the lung cancer death rate in all ages of both males and females.⁴ These data clearly shows that smoking control has the highest priority in Japan.

The Ministry of Health and Welfare, currently the Ministry of Health, Labor and Welfare of Japan, recently launched a new nationwide health promotion program 'Health Japan 21', in which smoking control is considered as one of the most important targets to be achieved during the first decade of the 21st century.⁵ The goals for smoking control were set as follows; (1) to distribute the knowledge on health effects of tobacco smoking, (2) to prevent underage minors from initiating smoking, (3) to ban smoking at the public space and workplace with separated smoking areas, which are equipped with effective measures for preventing nonsmokers from exposure to environmental tobacco smoke, and (4) to improve access to smoking cessation programs.⁶ As indicated by these goals, the workplace is one of the most important fields for smoking control.

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In contrast to many developed countries, where smoking control in the public and private workplaces has been enacted on the national level, such as in France, New Zealand, Norway and Sweden, or on the state level, such as in the United States and Canada,⁷ the situation in Japan is far from satisfactory. In 1996, Japan's former Ministry of Labor issued a guideline for smoking control in the workplace to prevent non-smokers from passive smoking,⁸ but no regulations have been enforced in accordance with the guideline. There are very few reports on the current situation of smoking control in the workplace in Japan.

The aim of this study was to conduct an epidemiological survey on the current situation of workplace smoking control, and to evaluate the effect of such workplace smoking control on the smoking prevalence among Japanese workers.

Subjects and Methods

The participating workplaces were selected from approximately 1,500 workplaces in a certain prefecture, for which one nonprofit organization is providing periodical health checkups of employees by contract. A workplace here is defined as a plant, branch or any unit in a private firm or public sector, where a single occupational health system is operating. Five hundred thirty-one workplaces which appoint the personnel charged with occupational health were first selected, and each of these personnel was asked to answer a self-administered questionnaire regarding workplace smoking control programs in August 1998. Three hundred fifteen workplaces returned the questionnaire, which constituted the study sample for the present study (response rate: 59.3%).

The smoking prevalence data for each workplace was obtained from routine questionnaires about objective symptoms and life styles administered to all employees in the periodical health checkups. The number of employees in this smoking prevalence data was 57,051 males and 19,818 females. The workers not participating in the periodical health checkups were not included in this data, but the proportion of non-participants was expected to be very small, because the periodical health checkups were mandated by law.

The smoking prevalence was compared according to the presence or absence of various smoking control programs. To adjust for the effect of age on smoking prevalence, this comparison was done for age class 20–29, 30–39, 40–49, 50–59, and 60 or older, separately. The Mantel-Haenszel prevalence odds ratios and the 95% confidence intervals were calculated as summary measures adjusted for age. P-values were also presented in the tables. We considered differences significant at $p < 0.05$.

Table 1 Age-specific Smoking Prevalence among the Subjects

Age class	Males		Females	
	Number of subjects	Smoking prevalence (%)	Number of subjects	Smoking prevalence (%)
20–29	16,498	54.2	7,903	11.1
30–39	15,807	52.1	3,734	13.2
40–49	12,312	55.6	4,371	13.9
50–59	9,572	51.5	3,257	11.0
60–	2,862	45.9	553	10.7
Total	57,051	53.1	19,818	12.1

Results

The age-specific smoking prevalence in the study subjects is shown in Table 1. The overall smoking prevalence was 53.1% for males and 12.1% for females, respectively. The smoking prevalence did not differ considerably across different age groups from 20–29 to 50–59, but the workers of 60 years or older showed lower smoking prevalence in males. A similar tendency was observed for females, but the difference between workers younger than 60 and those of 60 or older was smaller than that in males.

Table 2 shows the numbers and ratios of workplaces with/without different smoking control programs being operated in the participating workplaces. The smoking control programs were classified to (1) restriction of smoking area and/or time, (2) use of educational materials, (3) lectures on the hazard of smoking, (4) award for workers who successfully stopped smoking, (5) prohibition of tobacco sales in the workplace, (6) consultation for smokers on an individual basis, and (7) cessation support programs for smoking workers. Regarding smoking restriction, 67.9% of workplaces answered that they restricted smoking areas in their workplaces, and 12.7% of workplaces answered they restricted smoking time. The former rate included the workplaces which restricted both area and time. On the other hand, 15.6% of workplaces answered that they had no restriction for smoking area or smoking time. As for the use of educational materials, 21.0% of workplaces answered they used posters, 14.0% answered they used booklets, and 20.0% answered they used other educational materials. For lectures on the hazard of smoking, only thirteen workplaces (4.1%) answered they gave a series of lectures in their workplaces. For the award for workers who successfully stopped smoking, ten workplaces (3.2%) answered they gave testimonials or other types of award. For tobacco sales in the workplace, 18.4% of workplaces answered they had shops selling cigarettes in their workplaces, and 52.1% answered they had only tobacco vending machines in

Table 2 Smoking Control Programs in Participating Workplaces

Smoking control programs		n	%
Restriction of smoking area and/or time	Total ban	3	1.0
	Restriction of smoking area*	214	67.9
	Restriction of smoking time	40	12.7
	Other restriction	7	2.2
	No restriction	49	15.6
	Unknown	2	0.6
Total		315	100.0
Use of educational materials (Not exclusive)	Posters	66	21.0
	Booklets	44	14.0
	Other materials	63	20.0
	None	187	59.4
Lectures on the hazard of smoking	Once a year or less	10	3.2
	1 to 2 times a year	2	0.6
	3 times or more	1	0.3
	None	302	95.9
	Total	315	100.0
Award for workers who successfully stopped smoking	Testimonial	9	2.9
	Others	1	0.3
	None	305	96.8
	Total	315	100.0
Tobacco sales in workplace	Tobacco shops**	58	18.4
	Vending machines	164	52.1
	None	88	27.9
	Unknown	5	1.6
	Total	315	100.0
Individual consultation for smokers	On periodical health checkups	78	24.8
	Independent of health checkups	17	5.4
	None	218	69.2
	Unknown	2	0.6
	Total	315	100.0
Cessation support programs for smokers	Providing programs in the workplace	7	2.2
	Contracting with organizations providing programs	7	2.2
	Recommending the use of programs outside the workplace	6	1.9
	Others	3	1.0
	None	292	92.7
	Total	315	100.0

*: includes the workplaces restricting smoking time as well.

**: includes the workplaces having vending machines as well.

their workplaces without a shop. The workplaces without tobacco sales in their workplaces constituted only 27.9% of participating workplaces. As for consultation for smokers on an individual basis, 24.8% of work-

places answered they gave individual consultation in the course of periodical health checkups, and 5.4% answered they gave individual consultations at other opportunities than periodical health checkups. As for smoking cessation support programs, only twenty-three workplaces (7.3%) answered they provided smoking cessation support programs. Of these workplaces, seven provided their own programs in the workplace, seven provided programs by contracting organizations outside the workplace, and six just gave information of outside organizations available for smoking cessation programs.

Table 3 shows the results of comparison of smoking prevalence between workplaces providing and not providing each smoking control program. For restriction of smoking area and/or time, the smoking prevalence was found to be higher in workplaces without any restriction. This difference was consistently observed in almost all age categories of males and females similarly. The Mantel-Haenszel summary prevalence odds ratio (males: 0.869, females: 0.555) shows that the restriction of smoking area and/or time is associated with 13.1% and 44.5% decrease in smoking prevalence for males and females, respectively ($p < 0.001$ for both sexes). As for the use of educational materials, the smoking prevalence was found to be slightly lower in male workers of workplaces, which used posters, booklets and other materials, but this was not observed in female workers. The Mantel-Haenszel prevalence odds ratio was 0.938 (95%CI: 0.923–0.952) for males and 1.034 (0.959–1.115) for females, respectively. For lectures on the harm of smoking, the smoking prevalence was not found to be different between male workers who were given lectures and those who were not given lectures, whereas the smoking prevalence among female workers who were given lectures was found to be lower by 14.4% as compared to those who were not given lectures, though it was not statistically significant ($p = 0.146$). For awarding the workers who successfully stopped smoking, a substantial difference was not observed among male workers, but the smoking prevalence in female workers of workplaces with awarding was found to be 34.6% lower than those without ($p < 0.001$). For tobacco sales in the workplace, no substantial difference was observed between male workers of workplaces with and without tobacco sales in the workplaces, whereas the smoking prevalence in female workers of workplaces without tobacco sales was found to be 20.4% lower than the remainder ($p < 0.001$). For individual consultation for smokers, no substantial difference was observed for male workers, but the smoking prevalence in female workers was found to be 13.4% lower than the remainder ($p < 0.001$). For cessation support programs, the smoking prevalence was found to be 13.9% for males ($p < 0.001$) and 20.6% for females ($p < 0.001$) lower in

Table 3 Difference in Smoking Prevalence by Presence or Absence of Smoking Control Programs

Smoking control programs	Age	Males				Females			
		YES		NO		YES		NO	
		n	prevalence (%)	n	prevalence (%)	n	prevalence (%)	n	prevalence (%)
Restriction of smoking area and/or time	20–29	15633	53.5	865	67.4	7463	10.3	440	23.2
	30–39	14978	51.4	829	65.1	3549	13.0	185	17.8
	40–49	11273	55.1	1039	62.1	4052	13.0	319	25.7
	50–59	8663	51.5	909	51.2	2941	10.6	316	15.2
	60–	2451	45.6	411	47.7	462	10.4	91	12.1
Use of educational materials (booklets, posters, etc)	20–29	8452	51.5	8046	57.1	4220	10.2	3683	12.0
	30–39	8740	49.8	7067	55.0	2022	14.5	1712	11.7
	40–49	6383	54.7	5929	56.7	1714	15.2	2657	13.1
	50–59	4699	51.5	4873	51.4	1467	11.7	1790	10.5
	60–	1118	46.5	1744	45.5	222	9.5	331	11.5
Lectures on the hazard of smoking	20–29	1123	52.0	15199	54.3	500	10.4	7345	11.1
	30–39	677	49.8	14982	52.2	89	10.1	3628	13.3
	40–49	294	62.6	11880	55.4	116	11.2	4158	14.0
	50–59	297	53.5	9009	51.3	92	7.6	3079	11.3
	60–	33	48.5	2786	45.7	3	0.0	545	10.6
Award for workers who successfully stopped smoking	20–29	620	51.6	15878	54.3	335	6.9	7568	11.2
	30–39	887	51.6	14920	52.2	226	10.2	3508	13.4
	40–49	1009	54.1	11303	55.8	314	10.5	4057	14.2
	50–59	732	51.4	8840	51.5	312	5.8	2945	11.6
	60–	147	45.6	2715	45.9	56	7.1	497	11.1
No tobacco sales in workplace	20–29	1816	61.7	14682	53.3	812	11.8	7091	11.0
	30–39	2206	55.2	13601	51.6	836	10.8	2898	13.9
	40–49	2735	53.0	9577	56.4	1633	11.3	2738	15.5
	50–59	1889	48.7	7683	52.1	991	8.3	2266	12.2
	60–	1054	45.5	1808	46.1	214	9.4	339	11.5
Individual consultation for smokers	20–29	8508	53.2	7990	55.3	3498	8.7	4405	12.9
	30–39	6568	50.4	9239	53.4	936	10.7	2798	14.1
	40–49	3927	55.6	8385	55.7	1386	15.8	2985	13.0
	50–59	3648	52.3	5924	50.9	1144	11.7	2113	10.7
	60–	923	47.6	1939	45.1	157	7.6	396	11.9
Cessation support programs for smokers	20–29	1433	46.1	15065	55.0	555	8.7	7348	11.2
	30–39	2395	44.2	13412	53.5	388	10.8	3346	13.5
	40–49	2098	49.7	10214	56.9	577	12.1	3794	14.2
	50–59	1169	48.3	8403	51.9	510	8.4	2747	11.5
	60–	290	42.8	2572	46.2	75	8.0	478	11.1

Smoking control programs	Males				Females			
	Odds ratio	(95%CI)		p	Odds ratio	(95%CI)		p
Restriction of smoking area and/or time	0.869	0.845	0.894	<0.001	0.555	0.494	0.623	<0.001
Use of educational materials (booklets, posters, etc)	0.938	0.923	0.952	<0.001	1.034	0.959	1.115	0.380
Lectures on the hazard of smoking	0.991	0.953	1.030	0.635	0.856	0.695	1.055	0.146
Award for workers who successfully stopped smoking	0.978	0.946	1.011	0.187	0.654	0.543	0.787	<0.001
No tobacco sales in workplace	1.018	0.997	1.039	0.093	0.796	0.724	0.876	<0.001
Individual consultation for smokers	0.978	0.962	0.993	0.006	0.866	0.799	0.939	<0.001
Cessation support programs for smokers	0.861	0.841	0.883	<0.001	0.794	0.695	0.907	<0.001

workers being given the programs than those not being given the programs.

The participating workplaces belong to various industries, and the smoking prevalence was found to differ by industry. Among male workers, the highest smoking prevalence, 75.1%, was observed in the construction industry, while the lowest prevalence, 26.6%, was observed in the telecommunication industry. Among female workers, the highest smoking prevalence, 29.5%, was observed in the wholesale and retail industry, while the lowest prevalence, 1.3%, was observed in the finance and insurance industry. Workers in different industries are expected to have different demographic and socioeconomic characteristics, and also workplaces in different industries might have different smoking control policies. Thus, the type of industry could act as a confounding factor in the present analysis.

In an attempt to control this confounding, the data were also analyzed, restricting them to the workers in the manufacturing industry, which constituted the majority of workers, 32,149 males and 8,641 females. The smoking prevalence among workers in manufacturing industry was 53.7% in males and 11.1% in the females, respectively, which did not differ from those in all workers combined; 53.1% in males and 12.1% in females, respectively. As shown in Table 4, the analysis for workers in the manufacturing industry gave results similar to those obtained for all workers combined among males in Table 3. However, there was some inconsistency with no tobacco sales in workplace and cessation support program among females. Restriction of smoking area and/or smoking time showed similar results in both males and females, which gave the largest effects of 15.4% and 36.2% lower prevalence in males and females, respectively ($p < 0.001$ for both sexes). The differences observed in all female workers combined for individual consultation for smokers were also identified in the analysis for female workers in the manufacturing industry (odds ratio: 0.804, 95%CI: 0.712–0.907). On the other hand, the difference observed for no tobacco sales in workplace was inversely significant in the analysis of the manufacturing industry for females (odds ratio: 1.415, 95%CI: 1.163–1.723).

Discussion

In the present study, the difference in the smoking prevalence was observed in both males and females, between workplaces with and without restriction of smoking area and/or time. The restriction of smoking area and/or time is usually introduced to prevent nonsmokers from exposure to environmental tobacco smoke. In some workplaces, especially in the manufacturing industry, it is introduced because chemicals

and other flammable materials exist in the workplace. Whatever the reason for restriction, the lower smoking prevalence in workplaces with restriction might indicate that such restriction provides good circumstances for nonsmokers to refrain from starting smoking and for smokers to stop smoking. In the present study, the time when each smoking control had been introduced was not specified, and it is not possible to make any causal inference between the smoking prevalence and control. To confirm the effect of restriction to lower smoking prevalence, a longitudinal observation of smoking status before and after the introduction of such restriction is necessary.

Similar results have been reported by other studies abroad. Kinne *et al.* reported that the smoking prevalence among male employees was found to be lower in workplaces with smoking restriction particularly when a total ban of smoking was enforced.⁹ Although this study could not show whether employees stopped smoking because of smoking restriction, it is noteworthy that 48% of male employees and 53% of female employees reported that they reduced the amount of cigarettes daily smoked because of smoking restriction. Farrelly *et al.* estimated the impact of workplace smoking restriction based on existing data and concluded that a 100% smoke-free workplace reduced smoking prevalence by 5.7 percentage points and average daily consumption among smokers by 14% (2.67 cigarettes a day) relative to workers subject to minimal or no restrictions.¹⁰ They also pointed out, however, that partial restriction would reduce average daily consumption only by 0.57 cigarettes a day. On the other hand, a longitudinal follow-up survey conducted by the Texas Department of Human Services reported that adoption of smoking restriction did not lower smoking prevalence significantly but did reduce average daily cigarette consumption significantly.¹¹

To our knowledge, this is the first study, which successfully showed in Japan the association of workplace smoking restriction on smoking prevalence. It is also noteworthy, however, that only 68% of workplaces had restriction of smoking area, which is considered to be more effective than restriction of smoking time for protection of nonsmokers from environmental tobacco smoke. In this regard, the present study provides a new line of evidence, which strengthens the motivation to introduce smoking restrictions into the workplace.

The present study also showed in the analysis of all workers combined that smoking prevalence among female workers was lower in workplaces giving an award for smoking cessation, no tobacco sales in the workplace, and individual consultation for smokers, although those phenomena were not found among males. Some of those lowering associations found among

Table 4 Difference in Smoking Prevalence by Presence or Absence of Smoking Control Programs (Manufacturing)

Smoking control programs	Age	Males				Females			
		YES		NO		YES		NO	
		n	prevalence (%)	n	prevalence (%)	n	prevalence (%)	n	prevalence (%)
Restriction of smoking area and/or time	20–29	10681	54.3	447	67.6	4188	9.4	103	12.6
	30–39	7858	51.1	408	67.2	986	11.5	46	17.4
	40–49	5248	55.7	492	65.7	1490	13.3	61	24.6
	50–59	5191	52.4	520	53.7	1466	12.0	68	19.1
	60–	1170	47.8	134	56.0	218	13.3	15	20.0
Use of educational materials (booklets, posters, etc)	20–29	5547	51.7	5581	58.0	2263	9.3	2028	9.6
	30–39	4117	49.3	4149	54.5	463	10.2	569	13.0
	40–49	3004	55.6	2736	57.5	626	13.4	925	14.0
	50–59	2705	51.2	3006	53.7	669	12.1	865	12.5
	60–	626	48.6	678	48.7	110	10.9	123	16.3
Lectures on the hazard of smoking	20–29	1123	52.0	9853	55.2	500	10.4	3734	9.4
	30–39	677	49.8	7472	52.1	89	10.1	929	12.1
	40–49	294	62.6	5340	56.1	116	11.2	1354	14.3
	50–59	297	53.5	5196	52.2	92	7.6	1360	13.1
	60–	33	48.5	1256	48.7	3	0.0	227	13.7
Award for workers who successfully stopped smoking	20–29	166	53.0	10962	54.9	184	9.8	4107	9.4
	30–39	162	44.4	8104	52.1	37	0.0	995	12.2
	40–49	123	64.2	5617	56.4	23	8.7	1528	13.8
	50–59	171	50.9	5540	52.6	19	5.3	1515	12.4
	60–	19	52.6	1285	48.6	2	0.0	231	13.9
No tobacco sales in workplace	20–29	713	64.2	10415	54.2	223	14.8	4068	9.1
	30–39	445	58.4	7821	51.5	49	18.4	983	11.4
	40–49	397	56.7	5343	56.5	130	16.9	1421	13.4
	50–59	444	51.6	5267	52.6	162	16.1	1372	11.9
	60–	92	54.4	1212	48.2	52	15.4	181	13.3
Individual consultation for smokers	20–29	7743	52.7	3385	59.8	3066	8.6	1225	11.4
	30–39	5499	49.8	2767	56.2	643	9.6	389	15.2
	40–49	2907	55.5	2833	57.6	776	13.4	775	14.1
	50–59	2924	52.4	2787	52.6	703	11.5	831	13.0
	60–	752	48.3	552	49.1	103	10.7	130	16.2
Cessation support programs for smokers	20–29	473	52.9	10655	54.9	267	10.9	4024	9.3
	30–39	470	47.2	7796	52.2	55	9.1	977	11.9
	40–49	347	56.5	5393	56.5	136	12.5	1415	13.9
	50–59	277	46.6	5434	52.8	105	12.4	1429	12.3
	60–	94	43.6	1210	49.0	11	18.2	222	13.5

Smoking control programs	Males				Females			
	Odds ratio	(95%CI)		p	Odds ratio	(95%CI)		p
Restriction of smoking area and/or time	0.846	0.813	0.880	<0.001	0.638	0.492	0.829	<0.001
Use of educational materials (booklets, posters, etc)	0.923	0.904	0.942	<0.001	0.933	0.827	1.052	0.258
Lectures on the hazard of smoking	0.979	0.942	1.018	0.292	0.932	0.750	1.157	0.523
Award for workers who successfully stopped smoking	0.977	0.908	1.052	0.536	0.757	0.502	1.141	0.183
No tobacco sales in workplace	1.093	1.051	1.138	<0.001	1.415	1.163	1.723	<0.001
Individual consultation for smokers	0.923	0.904	0.942	<0.001	0.804	0.712	0.907	<0.001
Cessation support programs for smokers	0.938	0.894	0.983	0.008	1.020	0.806	1.291	0.867

females were disappeared when limited to manufacturing workers. This finding may be due to the smaller number of female subjects with each smoking control program rather than any behavioral differences in manufacturing workers. Again, only a few percent of workplaces introduced lectures and cessation support programs. The reason why tobacco sales in workplace had inverse results between all workers and manufacturing workers among females is not clear, as quite a few workplaces had no tobacco sales and there was not a sample size problem. Other causes like geographic bias should be considered.

In contrast to the Japanese situation, 70% of the worksites with 50 or more employees reported having written smoking policies in the United States.¹² Regarding cessation resources, the most frequently offered types were printed self-help materials (26%), stop-smoking classes (19%), lectures (13%), and support groups (11%). Eighteen per cent of worksites reported offering incentives for employees who stopped smoking such as reimbursements for the costs of participating in stop-smoking programs: fewer than 3% conducted stop-smoking contests, competitions, or similar activities. In the case of large California corporations with 500 or more employees, formal worksite smoking policies had been adopted by 87.1%, and payment for or subsidization of smoking cessation programs outside of health insurance was reported by 37.1% of the corporations.¹³ According to a study on the Canadian National Workplace Survey, 24.6% of workplaces with 20 or more employees in nongovernmental sectors provided smoking-related information, 25.1% of them had policies related to smoking, while 50.6% did not encourage smoking cessation in any way.¹⁴ Only 11.7% made smoking cessation programs available to their employees. As compared with these reports from abroad, the proportion of workplaces which gave lectures, award or cessation support programs was lower in the present study, as shown in Table 2.

There are several drawbacks to the present study. As mentioned above, the causal relationship between the initiation of workplace smoking control programs and the reduction of smoking prevalence could not be analyzed, because the date of initiating smoking restriction were not available in this study. We could not identify whether a lower smoking prevalence was caused by a larger smoking cessation rate or hiring of nonsmoking workers. Furthermore, the information on the sizes of workplaces (numbers of employees) was not available, and we could not deny the possibility that the sizes of workplaces may related to some characteristics such as the educational level of employees and quality of smoking control program provided by workplaces, which may affect smoking rates. In an attempt to have workers with similar demographic and socioeconomic

characteristics, we conducted the analysis restricted to workplaces in the manufacturing industry. The fact that it gave results similar to those obtained for all workplaces, at least among males, might indicate that difference in smoking prevalence is more likely to reflect a larger smoking cessation rate, since it is not likely that companies in the manufacturing industry have the motivation to employ nonsmokers. A longitudinal study to look at changes of smoking status on an individual basis is necessary to confirm this. A demographic analysis will be needed in order to confirm whether the workplace sizes had any relation with the smoking rate.

It should also be mentioned that the participating workplaces did not represent workplaces as a whole in Japan. Moreover, the workplaces used in this study had not been randomly selected. Therefore, it may not be possible to use the percentages given in Table 2 as estimates for the whole country. The fact that smoking prevalence in the present study was not significantly different from reported national estimates is encouraging that we have a representative sample. Additionally, even if the sample in this study was not national representative data, the association between smoking prevalence and smoking control programs obtained in this study should not be failed.

In conclusion, it is suggested by the present study that workplace smoking restriction may lower the smoking prevalence by facilitating smoking cessation. It was also suggested that individual consultation for smokers might be effective in lowering smoking prevalence of female workers. Further studies are needed to confirm these possibilities by longitudinal observational studies and by interventional trials. It is also noted that the proportion of workplaces which gave smoking control programs was not large enough to lower the smoking prevalence substantially. Further efforts are necessary to implement workplace smoking control activities.

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