Brief Report

Longitudinal observation of influence of "taspo" on smoking behavior among high school students

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Summary **A system with an adult discrimination IC card "taspo" was introduced in 2008 to prevent minors from purchasing cigarettes in Japan. This study aimed to elucidate the short-term change in smoking behavior among a cohort of high school students through the introduction of the taspo system. We conducted a questionnaire survey in students at one high school in the metropolitan area of Japan in 2008. In this area, the taspo system was introduced on July 1, and the survey was conducted before and after its introduction (June and September). Change in smoking behavior was examined by linking the two questionnaires using a unique identification number for each participant. The questionnaire included basic characteristics, smoking-related behavior, and means of obtaining tobacco. Of 133 students, 123 (response rate 84.7%) completed the before and after questionnaire forms and could be linked. The smoking rate was 22.8% in June and 25.2% in September, with no statistically significant change. Vending machines were the major means of obtaining tobacco in June, while the use of cigarette shops and supermarkets increased after the introduction of taspo. The introduction of taspo hardly influenced underage smoking behavior during the observation period in our study subjects. The only significant change was in the means of obtaining tobacco. To prevent underage smoking, the importance of comprehensive restriction of the procurement route was suggested.**

Keywords: Underage, smoking, vending machine, smoking prevention

1. Introduction

Prevention of underage smoking is one of the most important anti-smoking strategies. A longer smoking duration has been demonstrated to be associated with higher risk of cancer, cardiovascular disease, and other illnesses, and starting to smoke before the age of 20 will increase the level of dependency on nicotine, making smoking cessation more difficult (*1*).

In Japan, vending machines with adult identification functions using the IC card "taspo" were introduced in 2008, to prevent minors purchasing cigarettes. The results of a nationwide survey in 2004 revealed that 82.5% of male students and 77.8% of female students among surveyed high-school students with a smoking habit chose vending machines as the most common place to purchase cigarettes (*2*). The taspo system, therefore, is expected to make cigarette purchase more difficult for minors, leading to a decrease in the smoking rate in this group.

The aim of this study was to elucidate the changes in smoking behavior after taspo introduction among the students of one high school in the metropolitan area, using longitudinal data of a small cohort population.

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2. Methods

2.1. *Survey subjects*

We surveyed 158 underage students (as of September, 2008) at one part-time high school in the metropolitan

area who attended school on the first day of survey (June) and consented to participate in the survey.

2.2. *Methods of survey*

Surveys using anonymous self-administered questionnaires were conducted before and after taspo introduction (June and September, 2008). In this area, the taspo system was introduced on July 1, 2008. To conduct the survey, homeroom teachers distributed the questionnaire forms and instructions after school hours. They explained to the students, following the instructions provided by the investigators, that their responses would remain anonymous and be handled confidentially, and instructed them to answer on their own.

The questionnaires included items of basic demographic characteristics (sex and age), smoking status, age of starting smoking, number of cigarettes smoked per day, and means of obtaining tobacco (vending machines, convenience stores, cigarette shops, given by friends, upperclass students, or other people, and home).

Definitions of smokers were: "ever-smokers" = those who had ever smoked a cigarette; "smokers for the month" = those who had smoked daily or occasionally during the past 30 days; and "daily smokers" = those who had smoked daily for the past 30 days.

Only the students who consented to participate in the survey were included in the study. They were each assigned a unique ID for this study. Data from the baseline survey and the survey after 3 months were linked with each other using these IDs.

The completed questionnaire forms were sealed by the responders, thus securing privacy. This study was reviewed by the ethics committee of the National Institute of Public Health.

2.3. *Analysis*

NcNemar test was used to analyze the relation between taspo introduction and smoking rate. Statistical software, SPSS 15.0J, was used, and the significance level was set at 5% (two-sided).

3. Results

Seventy-four responses from male students and 83 responses from female students were collected, with one uncompleted form in June (collection rate 99.4%). The responses from the two surveys could be linked for 133 students (collection rate 84.7%). Analysis of the survey included a total of 58 male students (15 or 16 years, 29; 17 years, 11; and 18 or 19 years, 18) and a total of 65 female students (15 or 16 years, 32; 17 years, 19; and 18 or 19 years, 14).

Table 1 shows the smoking status by sex and age in June and September. For the male students in June, the proportion of ever-smokers was higher in older age groups, with 61.1% in the 18 to 19-year-old group. Female students did not show the same trend. The overall proportions of ever-smokers in June and September were similar (48.8% and 51.2%, respectively). The overall

Table 1. Proportions of ever-smokers, smokers for the month, and daily smokers before and after taspo introduction (*n* = 123)

		Age	Total	Ever-smokers[a]		Smokers for the month[b]		Daily smokers[c]	
		(years)	*n*	*n*	(%)	*n*	(%)	*n*	(%)
June	Male	15 or 16	29	10	(34.5%)	4	(13.8%)	1	(3.4%)
		17	11	5	(45.5%)	3	(27.3%)	1	(9.1%)
		18 or 19	18	11	(61.1%)	4	(22.2%)	3	(16.7%)
		Total	58	26	(44.8%)	11	(19.0%)	5	(8.6%)
	Female	15 or16	32	17	(53.1%)	9	(28.1%)	6	(18.8%)
		17	19	10	(52.6%)	4	(21.1%)	3	(15.8%)
		18 or 19	14	7	(50.0%)	4	(28.6%)	3	(21.4%)
		Total	65	34	(52.3%)	17	(26.2%)	12	(18.5%)
	Total		123	60	(48.8%)	28	(22.8%)	17	(13.8%)
September	Male	15 or 16	24	10	(41.7%)	7	(29.2%)	0	(0.0%)
		17	14	5	(35.7%)	4	(28.6%)	3	(21.4%)
		18 or 19	20	13	(65.0%)	4	(20.0%)	4	(20.0%)
		Total	58	28	(48.3%)	15	(25.9%)	7	(12.1%)
	Female	15 to 16	24	14	(58.3%)	8	(33.3%)	5	(20.8%)
		17	26	15	(57.7%)	5	(19.2%)	2	(7.7%)
		18 to 19	15	6	(40.0%)	3	(20.0%)	3	(20.0%)
		Total	65	35	(53.8%)	16	(24.6%)	10	(15.4%)
	Total		123	63	(51.2%)	31	(25.2%)	17	(13.8%)

[a] Ever-smokers: Those who had ever smoked a cigarette.
[b] Smokers for the month: Those who had smoked daily or occasionally during the past 30 days.
[c] Daily smokers: Those who had smoked daily for the past 30 days.

proportion of smokers for the month was 22.8% in June, while in September, the proportion was 25.2%. The male proportion of smokers for the month was higher in September (25.9%) than in June (19.0%). The overall proportion of daily smokers was approximately half that of smokers for the month.

Table 2 shows the changes in smoking status after taspo introduction. After taspo introduction, 6 out of 28 ceased smoking, while 9 started smoking. The change in smoking rate after taspo introduction was not statistically significant.

The number of cigarettes per day among smokers for the month in June was 10 or fewer in 15 students (53.6%), 11 to 20 in 11 (39.3%), and 21 or more in 2 (7.1%), while that in September was 10 or fewer in 17 (54.8%), 11 to 20 in 10 (32.3%), and 21 or more in 2 (6.5%).

Table 3 shows the results concerning the means of obtaining tobacco. The preferred means in June was vending machines (82.1%), followed by convenience stores (50.0%), cigarette shops (28.6%), and given by someone (friends, upperclass students, or other people) (17.9%). In September, the ratio of cigarette shops increased to 50.0%, followed by convenience stores (46.7%), and given by someone (26.7%). The ratio of vending machines markedly decreased to 20.0%. Among 19 smokers for the month who had previously purchased cigarettes mainly from vending machines, 16 responded that they had changed the means of obtaining tobacco, with 6 purchasing from cigarette shops, 4 from convenience stores, one from supermarkets, one from shops, one obtaining them at home, and 3 no-response. Among 3 smokers who did not change the means, one used the taspo card of a family member, one asked others to buy tobacco for him/her, and one did both.

4. Discussion

The primary purpose of introducing the taspo system was to prevent underage smoking. In this study, we investigated the short-term impact of taspo introduction at a high school, determining longitudinal changes for each student by linking data on smoking status before and after taspo introduction. The results showed no significant decrease in smoking rate.

There are two factors that may provide reasons for the lack of a decrease in smoking rate. The first is that students have other means of obtaining tobacco, although purchasing cigarettes from vending machines has become more difficult. The most common means in June was vending machines, as in national surveys (*2*,*3*) and other literatures (*4*,*5*), while in September after taspo introduction, the proportion of cigarette shops increased. The unchanged proportion of convenience stores and the increased proportion of cigarette shops may indicate that minors can purchase cigarettes even at shops where age confirmation should be required. The second reason for the lack of decrease in smoking rate is that minors can purchase cigarettes from vending machines merely by using the taspo card of other

Table 2. Smoking status before and after taspo introduction (*n* = 123)

			September						*p*-value
			Smokers[a]		Non-smokers[b]		Total		
			n	(%)	*n*	(%)	*n*	(%)	
June	Male	Smokers	10	(17.2%)	1	(1.7%)	11	(19.0%)	0.22
		Non-smokers	5	(8.6%)	42	(72.4%)	47	(81.0%)	
		Total	15	(25.9%)	43	(74.1%)	58	(100.0%)	
	Female	Smokers	12	(18.5%)	5	(7.7%)	17	(26.2%)	1.00
		Non-smokers	4	(6.2%)	44	(67.7%)	48	(73.8%)	
		Total	16	(24.6%)	49	(75.4%)	65	(100.0%)	
	Total	Smokers	22	(17.9%)	6	(4.9%)	28	(22.8%)	0.61
		Non-smokers	9	(7.3%)	86	(69.9%)	95	(77.2%)	
		Total	31	(25.2%)	92	(74.8%)	123	(100.0%)	

[a] Smokers: Those who smoked daily or occasionally during the past 30 days.
[b] Non-smokers: Those other than smokers.

Table 3. Means of obtaining tobacco before and after taspo introduction (multiple answers by smokers excluding non-respondents) (*n* = 28 in June, *n* = 30 in September)

		Convenience stores		Supermarkets		Vending machines		Cigarette shops		Given by someone		Homes	
		n	(%)	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)
June	Male	3	(27.3%)	0	(0.0%)	8	(72.7%)	2	(18.2%)	3	(27.3%)	0	(0.0%)
	Female	11	(64.7%)	1	(5.9%)	15	(88.2%)	6	(35.3%)	2	(11.8%)	2	(11.8%)
	Total	14	(50.0%)	1	(3.6%)	23	(82.1%)	8	(28.6%)	5	(17.9%)	2	(7.1%)
September	Male	7	(46.7%)	3	(20.0%)	2	(13.3%)	4	(26.7%)	4	(26.7%)	1	(6.7%)
	Female	7	(46.7%)	2	(13.3%)	4	(26.7%)	11	(73.3%)	4	(26.7%)	2	(13.3%)
	Total	14	(46.7%)	5	(16.7%)	6	(20.0%)	15	(50.0%)	8	(26.7%)	3	(10.0%)

people. In our study, some students responded that they had borrowed taspo cards from family members, or asked other people to buy cigarettes for them from vending machines. According to the report by the Tanegashima police department concerning minors taken into custody for smoking during the period of taspo trial operation (*6*), the number of such minors was 39 in 2003 before taspo introduction, while the number gradually decreased to 31 in 2004 when the taspo system was introduced in May, and to 10 in 2005. The number, however, markedly increased to 84 in 2006. As examples of the means of procurement, the police department listed: given by friends, borrowing taspo cards from family members or acquaintances without their permission, and asking someone to let them use their cards.

Our study has a few limitations. First, our results involving only one school may not be generalized. Second, the nature of the study did not allow us to have control samples, thus we failed to take into account a potential increase in smoking rate during long school holidays, suggesting that the effect of taspo to reduce smoking rate may have been underestimated. Third, this study was conducted a few months after taspo introduction, thus only enabling observation of changes in a short period. Since it is obvious that taspo introduction made cigarette purchase by minors difficult, the smoking rate will likely decrease in the middle and long term.

Based on our study, not only the taspo system but also any access to purchasing cigarettes should be limited for minors, with such as stricter age confirmation at convenience stores, cigarette shops, and other places across the nation. Increasing the cigarette price is also expected to be effective to prevent minors purchasing cigarettes. In addition to measures against obtaining tobacco, the following two strategies will be important. The first is to take measures in relation to people around minors. It is suggested that the environment surrounding minors, such as parents' smoking, affects their smoking status (*1*), and household smoking restrictions have been demonstrated to prevent minors from smoking (*7*). Therefore, anti-smoking strategies targeting minors should be wide ranging including those targeting adults. Second, in our study 30.5% of ever-smokers responded that they started smoking before junior high school (data not shown). Consequently, tobacco education should begin in nurseries, kindergartens, and primary schools before minors start smoking and smoking becomes a habit.

In conclusion, our study demonstrated that no significant change was observed in smoking rates of high school students in the metropolitan area after taspo introduction, while the main means of obtaining tobacco changed from vending machines to cigarette shops. The taspo system did not have a major effect in reducing the smoking rate of minors in the short term.

Acknowledgements

The authors thank the students, homeroom teachers, nursing teachers, and the principal for their cooperation. This study was conducted as a part of "Study on support and promotion for comprehensive implementation of health-promoting programs with anti-smoking measures" supported by a grant-in-aid for scientific research 2008 from the Ministry of Health, Labour, and Welfare.

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(Received June 13, 2010; Revised June 19, 2010; Accepted June 25, 2010)