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Recognition of the Deleterious Effects of Smoking among Senior High School Male Students

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Abstract The purpose of this study was to evaluate the prevalence of, attitudes towards, and knowledge about cigarette smoking among senior high school male students with different levels of academic ability. Self-administered anonymous questionnaires were distributed to 2014 students in July 2001. The prevalence of current smokers was 10.9% overall. The percentage of nonsmokers increased with academic ability level in both first and second graders. Students who recognize that cigarette smoking is associated with various diseases were more numerous than those reported in a nationwide Japan survey. Their recognition regarding the deleterious effects of smoking inclined toward diseases of the respiratory system. Correct knowledge concerning the detrimental effects of smoking on 10 selected diseases differed according to academic ability levels. They also thought that environmental tobacco smoke exposure was harmful to nonsmokers' health (86.6%). Although they fully understood the harmful effects of smoking, the percentage of current smokers who wanted to quit smoking (24.7%) was somewhat lower than that of those who did not (30.1%). A considerable number of current smokers, 95 of 219, had not made up their mind to quit smoking. To reduce the numbers of adult smokers, it is important not only to prevent students from starting to smoke or to encourage smokers to quit but also to guide undecided smokers in how to quit.

Key words : minor, smoking, senior high school male student

Introduction

Smoking-related disease is recognized as one of today's major preventable health problems. In Japan, publicity regarding the dangers of smoking, warning signs on tobacco packaging, the introduction of anti-smoking devices, a ban on TV and radio commercials for tobacco related products, non-smoking sections on airplanes, and litigation against the tobacco industry have been introduced²⁰. By those efforts, the overall rates of smoking for adult males have tended to somewhat decline¹⁹. However,

the government still holds two-thirds of tobacco industry stocks, and smoking rates have continued to rise in the adolescent population¹⁾ even though smoking by minors under the age of 20 has been prohibited by the law. The overall rise in adolescent smoking rates has been attributed to several factors, including targeted advertising¹⁰⁾¹⁷⁾, increased disposable income for purchase of cigarette¹²⁾, and so on. There is evidence that cigarette companies may have targeted young people in their magazine advertising, which is likely to reach a substantial number of young people. In 1998, the attor-

neys general of 46 states signed a Master Settlement Agreement with the four largest tobacco companies in the United States of America. That agreement prohibits tobacco advertising that targets those under 18 years of age. However, King et al. recently reported that the Master Settlement Agreement with the tobacco industry appears to have had little effect on cigarette advertising in magazines or on the exposure of young people to such advertisements¹³⁾. They suggested that more stringent policies might be required.

Chronic inhalation of cigarette smoke is a major risk factor in the development of lung cancer. Lung cancer mortality has been increasing rapidly in recent years in Japan and has exceeded stomach cancer mortality among Japanese males. The risk of lung cancer among ex-smokers after quitting for more than 10 years is reduced to the level of nonsmokers²¹⁾, confirming the importance of quitting cigarette smoking. A smoke-free society is the ideal goal in the prevention of lung cancer and other smoking-related disease. However, it is difficult for habitual smokers to quit. In addition, smoking has more harmful effects on the health of minors than on adult smokers¹¹⁾²²⁾. As reducing cigarette smoking among adolescents is a public health priority, anti-smoking educational programs should urgently be developed and introduced at an early age.

To investigate the actual conditions of teenage smoking, we designed a self-administered anonymous questionnaire for a sample of 2014 senior high school students with four different levels of academic ability, in which the prevalence of, attitudes towards, and knowledge about cigarette smoking among different academic ability levels were investigated.

Materials and Methods

Subjects

High school boys in Fukuoka City, which included four different levels of academic ability in each grade, were sampled. In July 2001, their class teacher distributed unsigned self-administered anonymous questionnaires to the students during the homeroom period. Having announced to the students that any information obtained by the questionnaire was to be confidential, they were asked to fill out the forms which were then collected by the teachers.

Sixty-six students were absent on the day the questionnaire were distributed, but the remaining 2014 students responded to the questionnaire, all of whom were included in the analysis.

Questionnaire

All students were questioned about smoking habits, knowledge about the health effect of smoking, and the idea of quitting smoking. Knowledge questions were organized into two categories: 1) knowledge of the health effects of smoking on 10 selected diseases (lung cancer, bladder cancer, bronchitis, asthma, heart disease, stroke, preterm birth, gastric ulcers, the common cold and AIDS), and 2) knowledge of the effects of environmental tobacco smoke (ETS) exposure on nonsmokers's health. Current smokers were asked about the idea of quitting smoking.

Statistical analysis

Statistical analysis was performed with the Windows-SAS statistical package (SAS Institute Inc., Cary, NC)¹⁸⁾. Students were classified into four categories according to their academic ability: level 1 (lowest), level 2, level 3, and level 4 (highest). They were also divided by their smoking habits: nonsmokers; those

who had never smoked, ex-smokers; those who had smoked at some time but had stopped, and current smokers. Knowledge was probed using yes or no questions. Attitudes toward smoking were classified: I want to quit, I do not want to quit, and I am undecided. The trend of rates was determined by a trend test using a logistic regression model.

Results

The average percentage of current smokers was 10.9%, ranging from 6.3% for first graders to 15.5% among third graders (Table 1). Thirty five % of all students were current or ex-smokers while 65% were nonsmokers. The percentage of current smokers among both first ($P_{trend}=0.06$) and second ($P_{trend}=0.02$) graders increased with a rise in their academic ability

level. The percentage of nonsmokers ($P_{trend}=0.0001$) and current smokers ($P_{trend}<0.0001$) significantly changed with their grade, altering the direction of change. However, the prevalence of ex-smokers did not vary materially by their school grade or academic level.

As shown in Table 2, the percentage of students who recognized that cigarette smoking harms their health was higher than we expected. However, recognition regarding the deleterious effects of smoking tended toward diseases of the respiratory system. Although almost all students recognized that cigarette smoking was associated with an increased risk of lung cancer (91.6% overall), they were not fully aware of an inverse association between smoking and bladder cancer (32.1%) or gastric ulcers (36.6%). Most knew that AIDS (95.6%) and the common

Table 1 Prevalence of smoking among senior high school students

Grade*	Level**	Smoking habits			Total
		Nonsmoker No. (%)	Ex-smoker No. (%)	Current smoker No. (%)	
1	1	319 (68.8)	110 (23.7)	35 (7.5)	464
	2	69 (65.7)	31 (29.5)	5 (4.8)	105
	3	38 (74.5)	12 (23.5)	1 (2.0)	51
	4	57 (89.0)	5 (7.8)	2 (3.1)	64
	P_{trend}	0.0037	0.041	0.059	
	Subtotal	483 (70.6)	158 (23.1)	43 (6.3)	684
2	1	304 (61.5)	124 (25.1)	66 (13.4)	494
	2	65 (69.1)	23 (24.5)	6 (6.4)	94
	3	24 (52.2)	16 (34.8)	6 (13.0)	46
	4	58 (77.3)	14 (18.7)	3 (4.0)	75
	P_{trend}	0.048	0.63	0.022	
	Subtotal	451 (63.6)	177 (25.0)	81 (11.4)	709
3	1	242 (56.5)	113 (26.4)	73 (17.1)	428
	2	56 (63.6)	25 (28.4)	7 (8.0)	88
	3	29 (76.3)	6 (15.8)	3 (7.9)	38
	4	39 (58.2)	15 (22.3)	13 (19.4)	67
	P_{trend}	0.20	0.30	0.63	
	Subtotal	366 (58.9)	159 (25.6)	96 (15.5)	621
	Total	1300 (64.5)	494 (24.5)	220 (10.8)	2014

* P_{trend} for grade were 0.0001 (nonsmoker), 0.59 (ex-smoker) and <0.0001 (current smoker)

** Academic ability level

Table 2 Prevalence of correct knowledge regarding correlations between cigarette smoking and various diseases

	Academic ability level				Total No. (%)
	1 No. (%)	2 No. (%)	3 No. (%)	4 No. (%)	
Lung cancer**	1251 (90.3)	264 (92.0)	127 (94.1)	202 (98.1)	1844 (91.6)
Bladder cancer	449 (32.4)	92 (32.1)	45 (33.3)	61 (29.6)	647 (32.1)
Bronchitis	1224 (88.3)	259 (90.2)	115 (85.2)	194 (94.2)	1792 (89.0)
Asthma*	1040 (75.0)	219 (76.3)	101 (74.8)	174 (84.5)	1534 (76.2)
Heart disease	689 (49.7)	157 (54.7)	83 (61.5)	103 (50.0)	1032 (51.2)
Stroke	873 (63.0)	165 (57.5)	94 (69.6)	116 (56.3)	1238 (61.5)
Preterm baby*	938 (67.7)	197 (68.6)	104 (77.0)	153 (74.3)	1392 (69.1)
Gastric ulcers	508 (36.7)	99 (34.5)	62 (45.9)	69 (33.5)	738 (36.6)
Common cold*	1139 (82.2)	239 (83.3)	101 (74.8)	159 (77.2)	1638 (81.3)
AIDS	1329 (95.9)	272 (94.8)	128 (94.8)	196 (95.1)	1925 (95.6)

* $P_{trend} < 0.05$ ** $P_{trend} < 0.0005$

cold (81.3%) were unrelated to smoking. As for the other diseases, approximately half of the students had a correct understanding. The prevalence of correct knowledge about the effects of smoking on lung cancer, asthma and preterm birth increased with the academic ability level, whereas that regarded the common cold showed a reverse association.

Almost all students gained a better understanding of the harmful effects of ETS exposure on nonsmokers' health (96.6% overall) regardless of academic ability level (Table 3). Although they fully understood the harmful effect of smoking, the number of current smokers who want to quit smoking (24.7%) was

somewhat lower than those who did not (30.1%) (Table 4). A considerable percentage of current smokers, 95 out of 219, remained undecided.

Discussion

As adolescent smoking has increased worldwide⁸⁾, health education programs have focused on prevention. Experiential interventions with a primarily social reinforcement/influence orientation and a secondary development/social norms orientation seem to have been quite effective in preventing adolescent smoking in schools⁹⁾. Social-influence curricula can even decrease the rate of smoking among adoles-

Table 3 Knowledge about effects of environmental tobacco smoke exposure on non smokers' health

	Academic ability level				Total No. (%)
	1 No. (%)	2 No. (%)	3 No. (%)	4 No. (%)	
Harmful	1333 (96.2)	277 (96.5)	133 (98.5)	202 (98.1)	1945 (96.6)
Harmless	17 (1.2)	4 (1.4)	1 (0.7)	2 (1.0)	24 (1.2)
No comment	18 (1.3)	4 (1.4)	1 (0.7)	2 (1.0)	25 (1.2)
No answer	8 (1.3)	2 (0.7)	0 (0.0)	0 (0.0)	20 (1.0)
Total	1386	287	135	206	2014

Table 4 Do you want to quit smoking?

	Academic ability level				Total No. (%)
	1 No. (%)	2 No. (%)	3 No. (%)	4 No. (%)	
No	55 (31.6)	4 (22.2)	2 (20.0)	5 (29.4)	66 (30.1)
Yes	43 (24.7)	6 (33.3)	1 (10.0)	4 (23.5)	54 (24.7)
Undecided	76 (43.7)	7 (38.9)	6 (60.0)	6 (35.3)	95 (43.4)
No answer	0 (0.0)	1 (5.6)	1 (10.0)	2 (11.8)	4 (1.8)
Total	174	18	10	17	219

cents who have already started to smoke⁸⁾. Interventions have included peer pressure, social learning with successful non-smoking peers acting as models, role-playing and discussion, group problem solving or combinations of all the above⁵⁾.

In this study, no biological marker was used to validate the smoking status reported by the students since this would have been difficult in such a large sample size and because most of the practical biomarkers are either insensitive or nonspecific in detecting very light and infrequent smoking. Because no biological marker was used, underreporting by smokers could not be excluded in the present study. In addition, minors may have been inhibited by legal controls on smoking. Efforts were made during the survey to minimize underreporting, including asking teachers to leave the classroom at the time of the survey and strongly emphasizing to the students that the questionnaire was anonymous and would not be disclosed to their parents or teachers.

As shown in Table 1, the 10.9% of overall percentage of current smokers was smaller than we had expected, and as shown by many studies, the rate of current smokers increased with their grade. A nationwide Japan survey of smoking habits among minors demonstrated that the percentage of current smokers in the third grade of senior high school boys was 36.9%¹⁹⁾.

The corresponding percentages in other studies were as follows: 25.5% in Japan¹⁸⁾, 19.3% in U. S.¹⁵⁾, 27.0% in Australia⁹⁾ and 21.0% in China²³⁾.

The prevalence of current smokers decreased with academic ability level among both first and second graders (Table 1). These results seem to agree with the results of some studies⁴⁾⁷⁾ in which subjects with the highest educational level tended to have a lower probability of being smokers at any given time than those at the lowest level. There was also a trend toward higher smoking frequency among subjects with a lower literacy level²⁾. However, among third graders, this tendency observed among lower graders disappeared since as i.e., third graders, they may smoke to relieve the stress of entrance examinations, boys with the highest academic ability level were more likely to smoke. Therefore, the rates of smoking may eventually converge on the same level.

In this study, all students realized that smoking was bad for their health (data not shown) and that ETS exposure was also harmful to nonsmokers (Table 3). Knowledge regarding the correlations between smoking and selected diseases mainly depended on whether they made an association with respiratory disorders. The Japan study¹⁹⁾ indicated that subjects over 15 were aware of the association between smoking and lung cancer (84.5%), bronchitis (65.5%), asthma (59.9%), heart disease (40.5%), stroke

(35.1%) and gastric ulcers (34.1%). Emmanuel et al.⁶⁾ examined this question in the third article of their series, which mainly assessed the awareness of school children about the harmful effects of smoking. They reported that the majority (90%) of school children surveyed were aware of its harmful effects. Current smokers appeared to be less knowledgeable (69.4%) than nonsmokers (89.3%). The most common responses given by the children on the specific ill effects caused by smoking were lung cancer (49%), smoking is bad for health (25%), smoking is bad for passive smokers (7%), and for heart disease (6%). The students we surveyed were more knowledgeable about the harmful effects of smoking than average school children in Japan and Singapore⁶⁾⁽¹⁹⁾. Surprisingly, almost of them knew that ETS exposure is harmful to health.

Current smokers who did not want to quit were only 24.7%. This figure was approximately half of that in Emmanuel et al.⁶⁾. As the smoking habit is difficult to break, anti-smoking efforts should be exerted toward the undecided to reduce the overall percentage of smokers.

One limitation of this study is that we investigated male students only. Numerous studies have reported that the smoking rate was much higher among boys than girls⁶⁾⁽⁷⁾⁽⁹⁾⁽¹⁰⁾⁽¹⁵⁾⁽¹⁶⁾⁽¹⁹⁾⁽²³⁾. However, several epidemiological and molecular epidemiological studies indicate that, for a given number of cigarettes smoked, females may be at higher risk for lung cancer than males¹⁴⁾. Further research is needed based on a large sample of female students.

Tobacco use poses one of the greatest health problems at school. Prevention through health education should put a high priority among all school, community, and health personnel. Although teenage smoking is motivated by a

combination of various factors, peer pressure is most important. Familial, psychological and student social dynamic factors should all be taken into account in future smoking control programs for minors.

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(和文抄録)

喫煙による健康影響についての男子高校生における認識調査

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清 原 千香子・鷲 尾 昌 一

本研究の目的は、男子高校生の喫煙率、喫煙態度、喫煙の影響についての認識を学力別に調べることである。2014名の生徒について無記名での質問票式調査を行った。現喫煙者の割合は10.9%であった。1, 2年生においては、非喫煙者の割合は学力が上がるにつれて低下していた。日本での全国調査の結果と比較すると、喫煙が種々の疾病と関連していることを知っている者の割合は、本調査対象者の方が高かった。しかし、喫煙と関連していると考えている疾病は呼吸器疾患に偏っていた。喫煙との関連性について正しい認識率を調査した10疾患のうちいくつかの疾患では、正しい認

識率に学力間で有意な傾向性（学力の上昇に伴い認識率が上昇する）が認められた。また、彼らの多くは（86.6%）非喫煙者にとっては受動喫煙（環境たばこ煙曝露）も健康に有害であることを知っていた。彼らは喫煙が有害であることを十分理解しているにもかかわらず、現喫煙者の中で禁煙したいと思っている生徒の割合（24.7%）は喫煙を希望しない生徒の割合（30.1%）よりも低かった。成人での喫煙率を更に減らすには、未成年での防煙だけではなく、禁煙の意志決定がなされていない者への禁煙指導も重要である。