

Relationship between Smoking Initiation and School Characteristics According to Grade Level among High School Students in Korea

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<Abstract>

Objectives: Students' life changes substantially as grade increases. It implies that risk factors that trigger students' smoking may not be consistent across grades. Most previous studies on student smoking have considered grade simply a control variable. This study examines which and to what extent risk factors are differently associated with smoking initiation according to grade level among high school students in Korea. **Methods:** Data from the Korean Youth Risk Behavior Web-based Survey (KYRBWS) conducted by the Korea Centers for Disease Control and Prevention (KCDC) in 2007 and 2008 were analyzed in this study. **Results:** Among boys, school location, school type and pocket money etc. significantly influence smoking initiation in the first grade than in any other grades, but the strength of the association decreased as grade increases except academic performance. Among girls, most independent variables were associated with smoking initiation in the second grade except school location, pocket money per week and academic performance. **Conclusions:** Our results suggested that the variables related smoking initiation in Korean high school students were notably different by grade and gender. These findings can serve as the basis of policy recommendations with regard to school efforts to prevent student smoking.

Keywords: Adolescent, Smoking initiation, Grade, School year, High school

I. Introduction

Smoking has negative effects on physical, mental, and social well-being. Smoking during adolescence is found more likely to be fatal than smoking at any other stage in the life cycle (Coogan et al., 1998; Ezzati, Lopez, Rodgers, Vander, & Murray, 2002). Even more problematic is that the rate of smoking among adolescents has increased. It is difficult for adolescents to stop smoking when smoking has been engrained as a habit. Thus, prevention is far more important than smoking cessation programs, particularly among adolescents.

The literature suggests that school characteristics significantly influence smoking in adolescence (Shin & Jeong, 2007).

Smoking rates, in general, are different according to students' age or grade. Also, smoking rates vary by the school location, class compositions, purpose of education, and/or coeducational status. For example, vocational high school students are more likely to smoke compare to their counterparts in academic ones (Kim et al., 2006) This is because adolescents tend to form their identities and to establish their behavioral habits by emulating the features of the individuals and environments in which they exist (Anderson & Burns, 2000). As students are grouped according to grade, those in the same grade create and share a common culture. This intra-grade cohesion is especially true with regard to the establishment and maintenance of friendships, which have the greatest influence on smoking initiation.

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In this context, it may be expected that the factors that contribute to smoking initiation would differ by grade. According to a study, the effect of peer influence on smoking initiation was stronger for 11th graders than the 8th graders (Urberg, Cheng, & Shyu, 1991). To our knowledge, there have been few attempts in Korea to examine the effect of student grade on their smoking initiation. This paper focuses on two points which have been largely ignored in adolescent smoking research in Korea; smoking initiation and student grade. Therefore, the purpose of this study is to examine differing effect of risk factors that contribute to smoking initiation by grade. Existing studies have not paid much attention to whether such differences by grade exist, because they either focused on only one grade or on used grade as a control variable.

This study focused on Korean high school students. According to previous studies, major factors contributing to smoking among Korean high school students are school related variables, including friendships (Kim et al., 2006). The Korean educational systems requires more time at school and greater dependency on school than do those of other nations (Ministry of Health & Welfare, 2009). In addition, the types of schools in Korea vary in terms of location, class composition, purpose of education (academic or vocational), and coeducational status (Kim et al., 2006). Therefore, it may be expected that these institutional differences will permit to observe differences in smoking initiation across grades.

II. Methods

1. Study Design

This is a cross-sectional study which examines which and to what extent risk factors are differently associated with smoking initiation according to grade level among high school students in Korea. Following two steps of analyses were employed here.

Step 1 : Logistic regression analyses were performed to examine relationship of significant factors between initiation of smoking and independent variables by grade.

Step 2 : To confirm the difference for corresponding ORs across grades, a statistical test of difference suggested by Brame et al. (1998) was utilized.

2. Data and Participants

The sample was restricted to students who started smoking during the year in which the research was conducted. Participation was also restricted to high school students because smoking is more prevalent among this group than among other group of adolescents.

Data from the *Korean Youth Risk Behavior Web-based Survey* [KYRBWS] conducted by the Korea Centers for Disease Control and Prevention [KCDC] in 2007 and 2008 were analyzed in this study. Data on smoking, drinking, gas or glue sniffing, perceived body weight, depressed mood, and so on were included. This study used 2 years of data to produce a large sample given that the rate at which students start smoking increase as a function of grade. The KYRBWS used a stratified multistage cluster sampling method that drew on all regions of Korea based on the proportions of students. A total of about 80,000 students were selected for participation from 400 middle schools and 400 high schools. All students in the selected classes with the exception of those with absenteeism, special difficulties, and dyslexia were eligible to participate. Students were seated randomly in a computer lab and used their certificate numbers to access and complete questionnaires during a regular class (40~45 min). The survey was conducted from September to October in each year and addressed 14 domains including 116 indices related to the health-risks faced by youth; a 13-question smoking-related questionnaire addressing current smoking, past smoking, daily smoking, and so on was also included. Participants also provided data for calculating the *Family Affluence Score* [FAS], which permits international comparisons and use in recent studies related to the adolescent (Hwang & Lim, 2009). According to previous studies, adolescent smoking initiation affected by the parents's smoking, relationship and capital in family.

Written consent was obtained from 37,392 boys and 34,781 girls in high school. We excluded students who had smoked at

least one grade prior to the current grade (i.e., already smokers), because this study was focused only on smoking initiation by grade. As a result, data obtained from 22,942 boys and 26,192 girls were used for the analyses.

3. Instruments

This study was excluded students who had already been smoker before the current grades by first asking “When did you first smoke at least once?”. Then we identified current smokers by additionally asking “How many days did you smoke during the last 30 days?” Students who responded “at least one day” were classified as “new smoker” who initiated smoking during the current grade. Others were classified as “none smoker.”

Family-related variables included FAS, living arrangements, and pocket money per week. The FAS was specifically designed for use with children aged 11–15 years as part of a previous WHO-Health Behavior in School-aged Children [HBSC] survey (<http://www.hbsc.org>). This instrument has been shown to have good criterion validity to measure students’ family social-economic background. How to construct FAS can be found elsewhere (Korea Centers for Disease Control and Prevention, 2008). Consistent with previous research, we included independent variables related to school, family, and personal characteristics; school location, school type, coeducation status, family affluence score, living arrangement, pocket money per week, par-time work experience, depressed mood, current alcohol intake and academic performance<Table 1>.

<Table 1> Description of the independent variables used in the analysis

	Variable	Measure
School	School location	0 = City, 1= Small and medium-sized, 2 = Rural
	School type	0 = Academic, 1 = Vocational
	Coeducation status	0 = Male or Female only, 1 = Coeducational
Family	Family Affluence Score(FAS)	0 = Upper, 1 = Middle, 2 = Lower
	Living arrangement	0 = Both parents, 1 = Single parent, 2 = Without parents or missing data
	Pocket money per week	0 = less than 10,000 won, 1 = 10,000~ 30,000 won, 2 = more than 30,000 won
Individual	Part-time work experience	0 = No, 1 = Yes
	Depressed mood	0 = No, 1 = Yes
	Current alcohol intake	0 = No, 1 = Yes
	Academic performance	0 = Upper, 1= Middle, 2 = Lower

4. Data Analysis

Separate analyses were conducted for boys and girls because variables and patterns related smoking initiation between girls and boys are very different (Anderson & Burns, 2000; Boles & Johnson, 2001; Kim et al., 2006). The smoking initiation rates of school, family and individual characteristics by gender and grade are also broadly different (see <Table 2>). Logistic regression was conducted separately for each grade and gender. Statistical tests of difference for corresponding ORs across grades were based on the method suggested by Brame et al. (1998). This method is applicable to all regression-type

problems that yield maximum-likelihood estimates. The significance level was set at 95% and all analyses were conducted using SAS (version 9.1).

III. Results

The distributions of smoking initiation by all key variables are provided for male and female students in <Table 2>. In general, the prevalence of smoking initiation by grade was higher among boys (8.5% in the first grade, 5.2% in the second

grade, and 4.6% in the third grade) than among girls (4.2% in the first grade, 2.6% in the second grade, and 2.2% in the third

grade). All variables, with the exception of FAS in second- and third-grade boys and in third-grade girls, were significantly associated with smoking initiation.

<Table 2> Percentage distributions of school, family, and individual characteristics of Korean high school students by sex and school grades

	Male (N=22,942)			Female (N=26,192)		
Grade	First	Second	Third	First	Second	Third
Sample size(N)	8,632	7,534	6,956	9,608	8,771	7,813
(unit : %)						
School-related variables						
School Location						
City	13.2	7.5	5.8	5.7	4.2	2.9
Small & medium-sized cities	9.0	4.8	5.6	4.9	2.7	2.6
Rural	7.2	4.9	3.7	3.4	2.2	1.8
School Type						
Academic	6.7	4.5	4.0	2.2	2.0	1.7
Vocational	15.3	7.8	7.0	9.8	4.8	3.8
Coeducation status						
Male or Female only	6.1	4.1	4.0	3.6	2.2	1.7
Coeducational	10.5	6.1	5.2	4.9	3.1	2.8
Family-related variables						
Family Affluence Score (FAS)						
Upper	7.8	5.1	5.5	3.2	2.4	2.1
Middle	8.6	5.0	4.1	4.2	2.4	2.1
Lower	10.0	6.3	5.6	5.8	4.0	2.8
Living arrangement						
Both parents	8.0	4.8	4.4	3.7	2.2	2.1
One parent	11.4	6.9	4.9	6.3	4.6	2.6
Without parents or missing data	11.0	7.0	6.8	8.7	6.3	3.8
Pocket money per week						
0-10,000 won less	6.6	3.7	3.9	2.7	2.0	1.5
10,000-30,000 won	8.9	5.5	4.4	4.4	3.0	2.2
More than 30,000 won	9.9	5.9	5.4	5.5	2.7	2.7
Individual-related variables						
Depressed mood						
No	7.3	4.4	3.7	3.1	1.8	1.8
Yes	11.0	6.7	6.1	5.7	3.8	2.6
Current alcohol intake						
No	5.6	3.3	2.3	1.9	1.3	1.0
Yes	18.4	10.1	10.3	12.6	6.6	5.9
Part-time experience						
No	7.0	4.0	3.8	2.9	1.8	1.6
Yes	16.5	10.1	8.7	10.5	6.5	5.1
Academic performance						
Upper	5.6	3.8	3.5	2.6	2.0	1.8
Middle	8.4	4.9	4.5	3.7	2.0	1.9
Lower	12.3	7.1	6.2	6.3	3.9	2.9
Total smoking initiation rate	8.5	5.2	4.6	4.2	2.6	2.2

	First grade			Second grade			Third grade		
	OR	(95% CI)		OR	(95% CI)		OR	(95% CI)	
Male or Female only	1.000			1.000			1.000		
Coeducational	1.195	0.995	1.436	1.056	0.829	1.344	0.923	0.712	1.198
Family Affluence Score (FAS)									
Upper	1.000			1.000			1.000		
Middle	1.139	0.941	1.378	1.026	0.789	1.334	0.885	0.653	1.200
Lower	1.142	0.875	1.489	1.234	0.868	1.753	1.227	0.842	1.787
Living arrangement									
Both parents	1.000			1.000			1.000		
One parent	1.139	0.908	1.429	1.141	0.846	1.540	0.883	0.621	1.255
Without parents & missing data	0.851	0.618	1.171	1.057	0.690	1.617	1.082	0.711	1.647
Pocket money per week									
0-10,000 won less	1.000			1.000			1.000		
10,000-30,000 won	1.276	1.042	1.563	1.408	1.053	1.881	1.050	0.764	1.444
More than 30,000 won	1.294	1.040	1.609	1.340	0.985	1.822	1.171	0.849	1.614
Depressed mood									
No	1.000			1.000			1.000		
Yes	1.405	1.196	1.650	1.384	1.117	1.714	1.540	1.222	1.940
Current alcohol intake									
No	1.000			1.000			1.000		
Yes	3.221	2.738	3.788	2.693	2.164	3.352	4.125	3.231	5.267
Part-time experience									
No	1.000			1.000			1.000		
Yes	1.583	1.318	1.901	1.751	1.384	2.216	1.364	1.037	1.794
Academic performance									
Upper	1.000			1.000			1.000		
Middle	1.456	1.179	1.799	1.260	0.955	1.662	1.245	0.927	1.673
Lower	2.022	1.666	2.454	1.683	1.304	2.171	1.545	1.170	2.041
Intercept	0.025			0.017			0.017		

Note: Bold characters indicates $p < .05$.

<Table 4> Odds ratios for the effect of school, family, and individual characteristics on smoking initiation among Korean high school girls

	First			Second			Third		
	OR	(95% CI)		OR	(95% CI)		OR	(95% CI)	
Year									
2007									
2008	0.970	0.784	1.200	0.862	0.658	1.128	1.252	0.919	1.707
School Location									
City	1.000			1.000			1.000		
Small & medium-sized cities	0.918	0.676	1.246	0.818	0.557	1.201	1.007	0.637	1.592
Rural	0.851	0.622	1.164	0.732	0.501	1.068	0.883	0.559	1.396
School type									
Academic	1.000			1.000			1.000		
Vocational	3.277	2.607	4.119	1.659	1.233	2.233	1.288	0.891	1.862
Coeducation status									
Male or Female only	1.000			1.000			1.000		

	First			Second			Third		
	OR	(95% CI)		OR	(95% CI)		OR	(95% CI)	
Coeducational	1.295	1.040	1.614	1.351	1.020	1.791	1.530	1.112	2.107
Family Affluence Score (FAS)									
Upper	1.000			1.000			1.000		
Middle	1.307	0.968	1.766	0.940	0.642	1.377	0.954	0.636	1.431
Lower	1.837	1.412	2.391	1.671	1.207	2.315	1.368	0.940	1.990
Living arrangement									
Both parents	1.000			1.000			1.000		
One parent	1.186	0.902	1.559	0.892	0.630	1.262	1.080	0.692	1.685
Without & Missing data	1.303	0.922	1.842	1.107	0.716	1.712	1.292	0.758	2.202
Pocket money per week									
0~10,000 won less	1.000			1.000			1.000		
10,000-30,000 won	1.056	0.794	1.405	1.452	1.023	2.060	0.825	0.521	1.306
More than 30,000 won	1.385	0.898	2.137	1.999	1.180	3.387	1.151	0.601	2.204
Depressed mood									
No	1.000			1.000			1.000		
Yes	1.509	1.217	1.871	1.679	1.272	2.215	1.285	0.940	1.756
Current alcohol intake									
No	1.000			1.000			1.000		
Yes	5.067	4.062	6.319	4.135	3.101	5.513	4.825	3.430	6.787
Part-time experience									
No	1.000			1.000			1.000		
Yes	1.731	1.381	2.171	1.920	1.432	2.573	1.769	1.229	2.546
Academic performance									
Upper	1.000			1.000			1.000		
Middle	1.534	1.149	2.048	1.327	0.931	1.892	1.341	0.855	2.103
Lower	1.618	1.197	2.186	0.976	0.665	1.433	1.434	0.911	2.258
Intercept	0.004			0.006			0.004		

Note: Bold characters indicates $p < .05$.

IV. Discussion

School level (middle school and high school), school type (general and vocational), coeducational status, and school location are well known factors with significant effect on smoking initiation of the adolescence (Kim et al., 2006). Recently, Byeon & Cho (2010) observed that smoking rate of schools appears to have an effect on student smoking status. Adolescence smoking initiation is thought to be influenced by school grade as also reflected in this study. School grade which is a smaller unit of the school suggests a cohort effect with a shared culture that is different from the other grades. For example, the policy of the school, curriculum, peer relationships as well as psychological factors like academic stress differ

across grades. According to Korean Educational Development Institute (2009), academic life which is society's prime expectation of students varies by grade. High school freshmen feel increasing pressure in their new school environment than that of middle school. Entering into the second grade in high school, some students are getting sensitive on the entrance exam for university and employment while some may not. As students enter the third grade in high school, academic is becoming more compressed or intensified as they are faced with preparation for entry to university or employment, thus, they are exposed relatively to more stress like having more assignments compared to those in lower grades. In this study, the variables affecting smoking initiation differs by grade and gender.

School type particularly vocational high school is related with smoking initiation, regardless of gender, but its influence decreases as the students' grade increased. The early smoking initiation of those in vocational high school may be explained by their vulnerability. Those who entered vocational high school are mostly from families with relatively lower socio-economic position, lower scores in middle school and so on (An, 2003). Thus, with being vulnerable and the pressure in their new environment, the students tend to form friendships with peers who are similar, which contributes to the establishment of smoking and non-smoking peer groups. According to studies of peer relationships, students who smoke tend to choose other smokers as friends, and non-smoking students tend to form relationships with other non-smoking students (Bauman & Ennett, 1996; Han & Cho, 2005; Pinilla et al., 2002). However, these networks tend to decrease in influence following their initial formation (Baik & Seo, 1993). First grade students with characteristics that are vulnerable to smoking, become smoker in smoking favorable environment, but in the second, third grade students with adaptation and peer relationship, the influence of smoking friends is bound to be limited.

Coeducational status of the school is also related with smoking initiation and the smoking initiation rate of girls in coeducational school is up higher than that of their counterparts in an all-girls high school. This shows that coeducational status has a significant impact on the girl's smoking initiation although the proportion of those who initiated smoking goes down with increasing grade. The reason for the high probability of smoking initiation of the girls in coeducational status relative to non-coeducational status, regardless of the grade, could be their exposure to the smoking behavior of boys. Another reason for this high smoking probability of girls in coeducational status is gender discrimination experience in living together with boys (Kim, Kim, Kang, & Kim 2010).

In this view, peer relationships and smoking environment seem to have independent effect on the smoking initiation of boys and girls (Byeon & Cho, 2010). The high probability of smoking initiation of girls seems to be more related with frequent exposure in a smoking environment while the boys'

smoking initiation is more related with peer influence. The peer influence has little impact on the girls because they have less peer smokers. In addition, the boys form close friendship with the same gender, thus it is clearer that girls smoking initiation is affected more by smoking environment than peer relationships. Finally, girls of coeducational status who are continuously exposed to smoking environment may have changed their attitude towards smoking and have a greater possibility of experiencing gender discrimination through school life with boys. The smoking initiation of girls may be viewed as becoming more confident and getting an equal status with boys through smoking.

For both boys and girls, depression, part-time work experience, grades, and FAS are not significant. This shows that smoking initiation depends on the individual's choice rather than on worry about their career or their environment, especially in the third grade of high school. This is because during the third grade, ego-identity formation to some extent is more pronounced and students have the tendency to seek recognition. Also, during this time, there is consciousness of social advancement that is, knowledge of their responsibility as well as the urge to do something actually out of their parental choice (Korean Educational Development Institute, 2009).

This study has several limitations. First, it did not measure variables related to youth smoking nor did it include questions about smoking prevention and non-smoking education programs within schools. However, non-smoking education tends to be directed at non-smokers, whereas this study focused only on smokers. Furthermore, a focus on non-smoking education would not necessarily include attention to smoking among friends and parents, important contributors to smoking among adolescents. For these reasons, an exclusive focus on smoking prevention would preclude examination of factors related to school and family environments. Second, the data were cross-sectional rather than longitudinal. Although the sample is the largest of any used in a study of youth in Korea, its cross-sectional nature precludes conclusions about causality. Third, the use of self-reports may have resulted in an underestimation of the real smoking rates due to the stigma of smoking. Thus, further

longitudinal research is required to examine issues related to continued smoking. Fourth, this study would have been underestimating the initiators in the grade. Because the survey was done during September or October of the year, students who initiated smoking between November and December would have been excluded.

V. Conclusions

Despite the aforementioned limitations, this study clarified the factors leading to smoking initiation according to grade based on the largest sample of adolescents used to date. This study examined changes in adolescent smoking behavior as a function of grade; these findings require rejecting a standardized approach and suggest the need to develop a new smoking preventive education program that takes grade-specific characteristics into account. Although the percentage of newly started smoking rate is low in the second and the third grades, anti-smoking education is still required because of the personal characteristics rather than school characteristics. Further, longitudinal studies are necessary to reveal the causal relation between smoking initiation and grade in further research.

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