

Early initiation of alcohol drinking, cigarette smoking and sexual intercourse linked to suicidal ideation and attempts: Findings from the 2006 Korean Youth Risk Behavior Survey

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ABSTRACT

Using the 2006 Korean Youth Risk Behavior Survey, a nationally representative sample of high and middle school students (32,417 males and 31,467 females) in grades 7–12, this study was to examine the association between early initiation of problem behaviors (alcohol drinking, cigarette smoking, and sexual intercourse) and suicidal behaviors (suicidal ideation and attempts), and to explore the effect of concurrent exposure to those problem behaviors on suicidal behaviors, controlling for confounding factors. Preadolescent initiators with each problem behavior were at greater risk for suicidal behaviors than non-initiators, in both genders, even after controlling for covariates. The more problem behaviors males and females concurrently experienced, the more likely they were to seriously consider suicide and to attempt suicide. Although being on the same occurrence, however, this pattern was more clearly observed in preteen initiators than in teen initiators.

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INTRODUCTION

Suicide mortality has risen sharply among Korean adolescents aged 15-19 years old since the economic crisis (e.g., an increase of 40.7% from 7.6 in 2001 to 5.4 per 100,000 in 2005), and is the second leading cause of death for this population.¹

Adolescent suicide and suicidal behaviors (suicidal ideation and attempts) have become major public health issues in Korea, underscoring the importance of determining the risk factors associated with suicide behaviors. In recent years, beyond multiple risk factors in adolescence found in most previous studies,²⁻⁵ early age of onset of alcohol drinking, cigarette smoking, and sexual intercourse (during childhood) have been reported to be important predictors of later suicidal behaviors (during adolescence).⁶⁻¹¹ Except for alcohol drinking, which is usually measured by self-reported age of first drink of alcohol for other than religious reasons,⁹⁻¹¹ age of initiation of cigarette smoking and sexual intercourse variables were conservatively measured in most previous studies (i.e., “regular/daily smoking or smoking a whole cigarette” and “unwanted/forced sexual intercourse”).^{6-9,12} Due to this methodology, the contribution of early initiation of cigarette smoking and/or sexual intercourse in relation to suicide behaviors shown in the previous studies may have been relatively strong and statistically significant. Furthermore, according to Jessor’s the Problem Behavior Theory¹³, alcohol drinking, cigarette smoking, and sexual intercourse have been highly correlated and, even concurrently occurred. Kim¹⁴ reported that concurrent users of alcohol and cigarette were more vulnerable to other problem behaviors (leaving home, delinquency, entering merrymaking place, violation of school rules) and substance use (uses of stimulants/sleeping pills, marijuana, or butane gas/glue), compared to drinkers (no smoking), smokers (no drinking), and abstainers (neither drinking nor smoking).

However, little is known about the nature and extent of health effect of early concurrent exposure to the problem behaviors, particularly later suicidal ideation and attempts. According to the Korean Ministry of Health and Welfare, average reported age of drinking and smoking initiation has decreased from 15.1 and 15.0 years olds in 1998 to 13.1 and 12.5 years olds in 2006, respectively; the prevalence of adolescent female smokers (12.8%) is in particular about two times higher than that of adult female smokers (5.6%); age at first sexual intercourse has also become younger,^{14,15} promoting an increased interest in their later psychological health status. Nonetheless, this population, with all these factors relating to problem behaviors and suicidal behaviors, has been relatively understudied.

Therefore, the purpose of this present study was to examine the associations between early initiation of alcohol drinking, cigarette smoking, and sexual intercourse and suicidal ideation and attempts. This study also determined the effect of concurrent involvements with those problem behaviors on each outcome, controlling for various confounding factors.

MATERIALS AND METHODS

Data and participants

The 2006 Korean Youth Risk Behavior Web-based Survey (KYRBWS) data conducted by the Korea Centers for Disease Control and Prevention (KCDC) to monitor the prevalence of youth risk behaviors were used for this study. The survey applied a stratified three-stage clustering design to produce a nationally representative sample of students in grades 7–12 attending public and private middle and high schools in all areas of Korea. The first stage contained 234 cities and districts which had similar

features on the basis of the degree of geographic accessibility, similar number of schools and populations, labor force participation rate, and employee rate for farming, mining, and service industries. In the second stage, 400 middle schools and 400 high schools were selected from the 234 cities and districts. The third stage of sampling consisted of randomly selecting one class from each grade within each chosen school. All students in selected classes were eligible to participate. Further details regarding the survey design and methods have been provided elsewhere.¹⁵

71,404 students were interviewed from a 78,593 sample (response rate: 90.9%).

However, 7,520 (10.5%) were omitted from the analysis due to missing information for important questions (e.g., alcohol drinking, cigarette smoking, sexual intercourse, suicidal ideation, suicidal attempts, and covariates). Consequently, data obtained from 63,884 adolescents (32,417 males and 31,467 females) were available for analysis (age range 13-19 years; mean age 15.5 years \pm 1.6 for both genders).

Measures

This study had two outcomes: suicidal ideation and suicidal attempts. Participants were asked whether they had seriously considered attempting suicide and had made a suicide attempt during the past 12 months, respectively. Response categories for each question were yes or no.

Variables of main interest in this study included three problem behaviors experienced by individuals: alcohol drinking, cigarette smoking, and sexual intercourse. Participants were asked what grade they were in when they first drank alcohol, smoked tobacco, and had sex, respectively, using a fourteen-point scale: never, preschool, and 1st to 12th grade. Responses were recoded into three categories: i.e., teen initiators (7th to 12th

grade), preteen initiators (1st to 6th grade or preschool), and non-initiators. Grade in school has been reported to be a more salient characteristic to students than age to elicit better recall of events.⁸ From the combination of three problem behaviors according to the period at first occurrence, nine different categories were produced, as shown in Table 4, to test our second hypothesis. For example, “teen initiators with one behavior” indicates individuals who initially experienced one of the three problem behaviors during teen years; “preteen and teen initiators with two behaviors” indicates individuals who initially experienced one of the three behaviors during teen years and then one of the other behaviors during preteen years.

Categorizations of several important covariates, such as age (in years), family living structure (living with both parents or living with a single parent/others), household economic status (low, middle, and upper), academic performance (low, middle, and upper), perceived body weight (underweight, about the right, and overweight), subjective sleep evaluation (satisfaction or dissatisfaction), and depressed mood (yes or no) were conventional and straightforward as shown in Table 2.¹⁶ We also included current alcohol drinking (yes if they had drunk alcohol one or more days during the past 30 days), current cigarette smoking (yes if they had smoked at least one cigarette during the past 30 days), current butane gas or glue sniffing (yes if they often or sometime sniffed butane gas or glue) and current unhealthy weight control behaviors (yes if they had used any of the following behaviors during the past 30 days, such as fasted for at least 12 hours or more, ate less, took diet pills, laxatives, or diuretics, vomited, and ate only one food) in the analyses to test whether early exposure to each problem behavior is independently linked to both suicidal ideation and attempts.^{4,5,8,16}

Statistical analysis

Distributions of suicidal ideation and suicidal attempts varied by gender, so adolescent males and females were analyzed separately in all analyses. Chi-square tests were used to examine the differences in the lifetime prevalence of alcohol drinking, cigarette smoking, and sexual intercourse between males and females (Table 1). Descriptive analyses were carried out to investigate the associations between early initiation of problem behaviors and suicidal behaviors using chi-square test and univariate logistic regression analysis (Table 2). To avoid any possible confounding effects of our interesting issues, multivariate logistic regression analyses were conducted and included all covariates (Table 3). Multivariate analyses were also performed to ascertain the effect of concurrent exposure to those problem behaviors on each outcome (Table 4). The significant level was determined at $p < 0.05$. All analyses were done using SAS statistical software (version 9.1).

RESULTS

Table 1 shows the grade at first exposure to alcohol drinking, cigarette smoking and sexual intercourse by gender. Overall, the lifetime prevalence for alcohol drinking (61.9% males vs. 61.1% females, $p = 0.0339$), cigarette smoking (32.0% vs. 22.1%, $p < 0.0001$) and sexual intercourse (6.4% vs. 3.2%, $p < 0.0001$) were more prevalent in males than in females, respectively. In addition, even more males than females reported having drunk alcohol (31.0% males vs. 24.7% females, $p < 0.0001$), smoked tobacco (13.8% vs. 8.3%, $p < 0.0001$) and had sex (1.3% vs. 0.5%, $p < 0.0001$) before attending middle school (preteen initiators).

Table 2 provides the gender specific percentage distributions and unadjusted odds ratios (95% confidential intervals) of suicidal ideation and suicidal attempts by all key variables, including three problem behaviors. In general, females had a greater risk of suicidal ideation (26.8% vs. 18.1%, $p < 0.0001$) and suicidal attempts (5.5% vs. 4.1%, $p < 0.0001$) than males (not shown in table). Compared to non-initiators of alcohol drinking, cigarette smoking, or sexual intercourse, male and female adolescents who had already initiated these behaviors at any period (either teen initiators or preteen initiators) were at greater risk for suicidal ideation and suicidal attempts. Particularly, the earlier alcohol drinking, cigarette smoking, or sexual intercourse adolescents initially experienced, the more likely they were to think about suicide or attempt to suicide. That is, compared to male and female teen initiators, male and female preteen initiators were at much greater risk of suicidal behaviors.

Table 3 presents the results of multivariate logistic regression analysis, in the form of odds ratios and 95% confidential intervals, for the associations of alcohol drinking, cigarette smoking and sexual intercourse initiation with suicidal ideation and suicidal attempts, after controlling for all covariates. As observed in the descriptive analysis, although the magnitudes of the associations of problem behaviors in relation to suicidal behaviors were considerably attenuated when covariates were taken into account, their associations remained still significant, except for some male and female teen or preteen initiators. This indicated that in both genders, preteen initiation of each alcohol drinking, cigarette smoking, or sexual intercourse was independently and significantly associated with elevated likelihood of suicidal ideation and suicidal attempts compared to non-initiation, and even teen initiation.

Table 4 displays findings of multivariate analysis focusing on involvement in concurrent experiences of problem behaviors, presenting logistic regression parameter estimates as odds ratios. Overall, the odds ratios increased as the frequency of concurrent experience of problem behavior increased, when examining at the same period of initiation. Interestingly, the odds ratios showed the pattern of associations between problem behaviors and suicidal behaviors different according to when they initially experienced. That is, although being concurrently exposed to the same frequency of problem behavior(s), preteen initiators were at greater risk of suicidal ideation and attempts than teen initiators. Indeed, preteen and teen initiators with two or more problem behaviors appeared much more likely to have suicidal behaviors than teen initiators with the same frequency of problem behaviors, but less than preteen initiators.

DISCUSSION

This part will be done

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Table 1. Grade at initiation of alcohol drinking, cigarette smoking, and sexual intercourse in Korean adolescent males (N=32,417) and females (N=31,467)

Grade	Alcohol drinking				Cigarette smoking				Sexual intercourse			
	Males		Females		Males		Females		Males		Females	
	Cases	%*	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%
Preschool	1,470	7.3	723	3.8	793	7.7	391	5.6	130	6.3	43	4.2
1st grade	310	1.5	108	0.6	261	2.5	108	1.6	24	1.2	5	0.5
2nd grade	362	1.8	188	1.0	472	4.6	237	3.4	13	0.6	8	0.8
3rd grade	642	3.2	305	1.6	624	6.0	328	4.7	23	1.1	9	0.9
4th grade	726	3.6	429	2.2	650	6.3	314	4.5	32	1.5	15	1.5
5th grade	891	4.4	765	4.0	512	4.9	383	5.5	37	1.8	22	2.2
6th grade	2,065	10.3	2,256	11.7	983	9.5	712	10.2	93	4.5	29	2.8
7th grade	2,897	14.4	3,899	20.3	1,254	12.1	1,289	18.5	139	6.7	71	7.0
8th grade	3,318	16.5	4,649	24.2	1,892	18.3	1,482	21.3	259	12.5	123	12.1
9th grade	3,366	16.8	2,995	15.6	1,489	14.4	870	12.5	376	18.1	159	15.6
10th grade	2,607	13.0	1,958	10.2	939	9.1	557	8.0	483	23.3	251	24.6
11th grade	1,060	5.3	731	3.8	370	3.6	206	3.0	325	15.7	196	19.2
12th grade	347	1.7	210	1.1	126	1.2	83	1.2	141	6.8	89	8.7
Total cases, %	20,061	100.0	19,216	100.0	10,365	100.0	6,960	100.0	2,075	100.0	1,020	100.0
%†		61.9		61.1		32.0		22.1		6.4		3.2

*% of total cases; †% of total populations (N)

Table 2. Prevalences and unadjusted odds ratios (95% confidential intervals) of the study variables by suicidal ideation and suicidal attempts in Korean adolescent males and females

	Males						Females							
	Suicidal ideation			Suicidal attempts			N	Suicidal ideation			Suicidal attempts			N
	%	OR	(95% CI)	%	OR	(95% CI)		%	OR	(95% CI)	%	OR	(95% CI)	
Alcohol drinking initiation														
Non-initiators	13.4	1.00		2.7	1.00		12,356	20.1	1.00		3.3	1.00		12,251
Teen initiators	19.9	1.60	(1.50-1.71)	4.2	1.58	(1.38-1.82)	13,595	29.1	1.63	(1.54-1.72)	5.8	1.81	(1.61-2.05)	14,442
Preteen initiators	23.4	1.98	(1.83-2.14)	6.4	2.44	(2.11-2.83)	6,466	37.0	2.33	(2.16-2.50)	10.2	3.36	(2.93-3.85)	4,774
Cigarette smoking initiation														
Non-initiators	15.4	1.00		3.2	1.00		22,052	23.4	1.00		4.1	1.00		24,507
Teen initiators	22.6	1.60	(1.49-1.71)	5.0	1.60	(1.40-1.84)	6,070	37.9	2.00	(1.87-2.14)	10.0	2.64	(2.35-2.96)	4,487
Preteen initiators	25.6	1.88	(1.74-2.04)	7.2	2.37	(2.07-2.742)	4,295	40.5	2.23	(2.05-2.43)	11.7	3.15	(2.74-3.62)	2,473
Sexual intercourse initiation														
Non-initiators	17.3	1.00		3.5	1.00		30,342	26.1	1.00		5.1	1.00		30,447
Teen initiators	29.3	1.99	(1.79-2.22)	9.4	2.83	(2.38-3.36)	1,723	45.7	2.38	(2.08-2.72)	14.3	3.08	(2.54-3.74)	889
Preteen initiators	37.8	2.91	(2.34-3.62)	23.0	8.14	(6.30-10.51)	352	51.2	2.95	(2.09-4.16)	31.3	8.42	(5.80-12.22)	131
Age*	16.4±1.7	1.07	(1.05-1.09)	16.3±1.7	1.02	(0.98-1.05)	32,417	16.3±1.7	1.00	(0.99-1.02)	16.1±1.7	0.94	(0.91-0.96)	31,467
Family living structure														
Living with both parents	17.6	1.00		3.8	1.00		27,572	25.7	1.00		5.0	1.00		26,814
Living with a single parent/others	21.2	1.26	(1.17-1.36)	5.8	1.59	(1.39-1.82)	4,845	33.2	1.44	(1.35-1.54)	8.2	1.67	(1.48-1.88)	4,653
Household economic status														
Lower	23.5	1.39	(1.24-1.55)	4.9	0.76	(0.63-0.92)	7,219	36.9	1.92	(1.70-2.17)	7.9	1.27	(1.03-1.57)	7,410
Middle	16.4	0.89	(0.80-0.98)	3.5	0.54	(0.45-0.63)	55,414	24.1	1.09	(0.97-1.22)	4.6	0.72	(0.59-0.88)	22,338
Upper	18.1	1.00		6.4	1.00		2,784	22.6	1.00		6.3	1.00		1,719
Academic performance														
Lower	21.4	1.30	(1.19-1.42)	5.0	1.02	(0.87-1.20)	10,779	32.1	1.55	(1.42-1.68)	7.1	1.56	(1.32-1.83)	10,343
Middle	16.2	0.92	(0.95-1.00)	3.2	0.65	(0.56-0.76)	16,966	24.4	1.06	(0.98-1.15)	4.7	1.00	(0.85-1.17)	17,048
Upper	17.4	1.00		4.9	1.00		4,672	23.4	1.00		4.7	1.00		4,076
Perceived body weight														
Underweight	18.0	1.13	(1.06-1.21)	4.0	1.02	(0.90-1.16)	11,364	25.4	1.04	(0.97-1.11)	5.0	0.99	(0.87-1.13)	7,156
About the right weight	16.3	1.00		3.9	1.00		12,974	24.7	1.00		5.1	1.00		15,669
Overweight	21.1	1.37	(1.28-1.47)	4.3	1.09	(0.95-1.26)	8,079	31.7	1.41	(1.33-1.50)	6.6	1.33	(1.19-1.49)	8,642
Current alcohol drinking														
No	15.8	1.00		3.1	1.00		22,676	23.8	1.00		4.2	1.00		23,007
Yes	23.6	1.65	(1.56-1.75)	6.3	2.08	(1.86-2.32)	9,741	35.1	1.74	(1.65-1.83)	9.2	2.34	(2.12-2.58)	8,460
Current cigarette smoking														
No	16.7	1.00		3.4	1.00		27,880	25.2	1.00		4.6	1.00		28,986
Yes	26.7	1.82	(1.69-1.95)	8.1	2.49	(2.20-2.82)	4,537	45.6	2.49	(2.29-2.71)	16.1	3.97	(3.53-4.49)	2,481
Current butane gas or glue sniffing														
No	17.7	1.00		3.8	1.00		31,832	26.6	1.00		5.3	1.00		31,187
Yes	41.2	3.26	(2.76-3.85)	20.2	6.45	(5.23-7.96)	585	48.2	2.57	(2.03-3.25)	26.1	6.28	(4.79-8.24)	280
Unhealthy weight control behavior														
No	16.2	1.00		3.6	1.00		22,355	22.5	1.00		4.3	1.00		13,380
Yes	22.3	1.48	(1.40-1.57)	5.1	1.44	(1.29-1.62)	10,062	30.0	1.47	(1.40-1.55)	6.4	1.50	(1.35-1.66)	18,087
Subjective sleep evaluation														
Satisfaction	14.7	1.00		3.2	1.00		20,201	22.2	1.00		4.3	1.00		17,763
Dissatisfaction	23.8	1.81	(1.71-1.92)	5.4	1.71	(1.53-1.91)	12,216	32.7	1.70	(1.62-1.79)	7.1	1.71	(1.55-1.88)	13,704
Depressed mood														
No	6.7	1.00		1.1	1.00		20,842	10.6	1.00		1.5	1.00		17,042
Yes	38.7	8.76	(8.20-9.36)	9.5	9.71	(8.40-11.24)	11,575	46.0	7.22	(6.81-7.66)	10.3	7.69	(6.71-8.80)	14,425

*Means and standard deviations of both 'non-suicidal ideation' and 'non-suicidal attempts' were 16.2±1.7 for males and 16.3±1.7 for females.

Table 3. Adjusted odds ratios (95% confidential intervals)* for the associations of early initiation of alcohol drinking, cigarette smoking and sexual intercourse with suicidal ideation and suicidal attempts in Korean adolescent males and females

	Males				Females			
	Suicidal ideation		Suicidal attempts		Suicidal ideation		Suicidal attempts	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Alcohol drinking initiation								
Non-initiators	1.00		1.00		1.00		1.00	
Teen initiators	1.11	(1.01-1.22)	1.06	(0.89-1.27)	1.21	(1.12-1.30)	1.23	(1.05-1.43)
Preteen initiators	1.28	(1.16-1.41)	1.27	(1.06-1.52)	1.45	(1.33-1.59)	1.61	(1.37-1.89)
Cigarette smoking initiation								
Non-initiators	1.00		1.00		1.00		1.00	
Teen initiators	1.05	(0.94-1.16)	0.82	(0.67-1.01)	1.28	(1.17-1.41)	1.35	(1.15-1.59)
Preteen initiators	1.26	(1.14-1.38)	1.15	(0.97-1.37)	1.50	(1.31-1.61)	1.48	(1.25-1.75)
Sexual intercourse initiation								
Non-initiators	1.00		1.00		1.00		1.00	
Teen initiators	1.13	(0.99-1.30)	1.54	(1.25-1.90)	1.40	(1.19-1.63)	1.52	(1.22-1.90)
Preteen initiators	1.38	(1.05-1.81)	2.55	(1.83-3.55)	1.66	(1.10-2.53)	2.49	(1.55-3.99)

*Adjusted for age, family living structure, household economic status, academic performance, perceived body weight, unhealthy weight control behavior, current alcohol drinking, current cigarette smoking, current butane gas or glue sniffing, subjective sleep satisfaction, and depressed mood

Table 4. Adjusted odds ratios (95% confidential intervals)* for the associations of concurrent initiation of alcohol drinking, cigarette smoking, and sexual intercourse with suicidal ideation and suicidal attempts in Korean adolescent males and females

	Males							Females						
	N	Suicidal ideation			Suicidal attempts			N	Suicidal ideation			Suicidal attempts		
		%	OR	(95% CI)	%	OR	(95% CI)		%	OR	(95% CI)	%	OR	(95% CI)
Non-initiators	11,267	12.9	1.00		2.7	1.00		11,748	19.5	1.00		3.2	1.00	
Teen initiators with one behavior	7,327	17.0	1.13	(1.02-1.25)	3.4	1.08	(0.90-1.32)	9,665	25.3	1.22	(1.13-1.32)	4.1	1.21	(1.03-1.43)
Teen initiators with two behaviors	3,981	20.8	1.16	(1.02-1.32)	3.7	0.81	(0.62-1.05)	3,389	35.3	1.56	(1.39-1.75)	8.6	1.73	(1.40-2.13)
Teen initiators with three behaviors	937	26.4	1.23	(0.99-1.51)	7.5	1.26	(0.89-1.79)	432	47.7	2.29	(1.80-2.90)	14.6	2.52	(1.78-3.56)
Preteen initiators with one behavior	4,171	19.4	1.30	(1.17-1.44)	3.9	1.09	(0.89-1.34)	3,305	32.5	1.54	(1.40-1.69)	7.1	1.65	(1.38-1.97)
Preteen initiators with two behaviors	1,668	24.6	1.47	(1.27-1.69)	6.4	1.44	(1.12-1.84)	969	44.1	2.06	(1.76-2.40)	13.6	2.33	(1.84-2.96)
Preteen initiators with three behaviors	147	49.7	2.46	(1.63-3.70)	34.7	6.55	(4.22-10.17)	46	65.2	3.52	(1.73-7.14)	54.4	8.09	(3.98-16.47)
Preteen and teen initiators with two behaviors	2,304	25.3	1.55	(1.36-1.76)	6.1	1.45	(1.14-1.84)	1,663	38.4	1.75	(1.53-1.99)	9.7	1.89	(1.51-2.36)
Preteen and teen initiators with three behaviors	615	36.1	1.77	(1.41-2.21)	15.3	2.63	(1.90-3.65)	250	53.6	2.45	(1.83-3.30)	22.8	3.37	(2.32-4.91)

* Adjusted for age, family living structure, household economic status, academic performance, perceived body weight, current alcohol drinking, current cigarette smoking, current butane gas or glue sniffing, unhealthy weight control behavior, subjective sleep evaluation, and depressed mood