2016년 8월

석사학위논문

가족 및 친구의 흡연과 청소년 흡연의 관련성

조선대학교 보건대학원

보 건 학 과

정 명 진

가족 및 친구의 흡연과 청소년 흡연의 관련성

The association between the smoking status of family and friends and adolescents smoking behavior in Korea

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이 논문을 보건학 석사학위신청 논문으로 제출함

2016년 4월

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CONTENTS

LIST OF TABLES

초록

가족 및 친구의 흡연과 청소년 흡연의 관련성

정 명 진
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목적: 청소년의 흡연은 성장기에 있는 청소년의 성장이나 건강에 악영향을 미치며, 성인기 흡연으로 연결될 수 있다. 본 연구에서는 한국 청소년의 학생들의 흡연현황을 파악하고 가족 및 친구의 흡연과의 관련성을 파악하고자 하였다.

조사방법: 질병관리본부가 수행한 제10차 2014년 청소년건강행태 온라인조사 원시자료를 이용하였으며, 최종적으로 72,060명의 자료를 이용하였다. 수집된 자료의 분석에는 SPSS 18.0 통계프로그램을 이용하였으며 성별에 따른 층화분석을 하였다. 일반적인 특성, 흡연과 관련된 특성, 가족 및 친구 흡연행태는 빈도와 백분율 및 카이제곱 검정을 실시하였다. 최종적으로 다중로지스틱회귀분석을 이용하여 청소년 흡연과 친구, 가족의 흡연의 연관성을 분석하였다.

결과: 청소년의 평생흡연율은 남학생 27.8%, 여학생 10.7%였으며, 현재흡연율은 남학생 13.3%, 여학생 4.1%였다. 다중 로지스틱회귀분석의 결과를 보면 여학생인 경우 친구가 흡연을 많이 하는 경우(OR:96.94, 95% CI=72.80-129.09) 현재흡연율이 높았으며, 남학생의 경우 형제가 흡연을 하는 경우(OR:2.29, 95% CI=2.01-2.61) 중학생 이전의 흡연율이 높았으며, 여학생인 경우 엄마가 흡연을 하는 경우(OR:2.79, 95% CI=2.01-2.61) 평생 흡연율이 높았다.

결론: 가족 및 친구의 흡연은 청소년의 흡연과 관련성이 있었으며, 가족의 경우 청소년과의 관계에 따라 차이가 있었다. 향후 청소년의 흡연 관리 시 가족이나 친구 등 가족환경적인 측면이나 사회적인 측면을 고려해야 함을 의미한다.

핵심어: 가족 흡연, 연관성, 청소년, 친구 흡연

Ⅰ. Introduction

Globally, smoking is one of the most serious diseases and causes of smoking-related disease and premature death. Around 6 million people die from smoking each year, it is responsible for 22% of global cancer deaths, 71% of all lung cancer deaths, and 10% of cardiovascular disease deaths. Consequently, exposure to second-hand smoke causes the premature death of 600,000 people every year (WHO, 2010). It has been reported that 22% of 8th graders and 46% of 12th graders tried smoking in spite of considerable public health efforts to prevent adolescent smoking in the US (Pollard et., al, 2010). The prevalence of cigarette smoking in 2013 was greater among boys (14.4%) than girls (4.6%) in middle and high school students, also the prevalence of current cigarette smoking among adolescents boys was greater than the HP 2020 target of 12.0% in Korea (Choi et al., 2014). The prevalence of smoking in Korea was one of the highest in Asia (46.7% of males and 7.1% of females in 2009). Between 2007 and 2010 there has been an increase in self-reported second-hand smoking exposure among females and children (Jeong et al., 2014).

Smoking can be especially damaging to the health of adolescents because their bodies are still developing physically, exposure to nicotine, tar, carbon monoxide and other carcinogens within tobacco trigger the development of chronic diseases and cause greater cell and tissue damage than they otherwise would in adults (So & Yeo, 2015). Especially, adolescent smokers were more likely to keep smoking throughout their lifetime. Early age of smoking may lead to other delinquencies such as substance use, dropping out from school, sexual risk taking, and violent conduct (Azgava et al., 2015).

In regards to smoking, adolescents were susceptible to influence by social and environmental factors. There have been various factors such as family history, companionship, personal characteristics and psycho-social

and psycho-pathological problems that influence smoking in adolescents (Park, 2011). Peer and familial influences on adolescent smoking behavior have been demonstrated by many cross-sectional studies. A number of studies have been conducted on adolescent smoking behaviour that show a link between smoking behavior and peer influence (Simons-Morton & Farhat., 2010,; Huang et al., 2013). A previous study has stated that there was a greater chance that children living with smoking parents will smoke and a smaller possibility that they will quit (Mak, et. al., 2012). When there is coercive pressure to do risky behaviors, peers have a profound effect on each other and may encourage experimentation. When it came to adolescents' use of tobacco and alcohol, there was convincing evidence that it was affirmatively associated with their friends' use or lack of use (Huang et.al, 2013).

Many previous studies have investigated adolescents' smoking behavior and the effect of family and friends smoking. However, most of these studies have utilized convenience sampling which was based on students from a certain city or province in Korea. Adolescents consider electronic cigarettes as a healthy option and an appealing characteristic of smoking electronic cigarettes is they don't give off an unpleasant odor. Therefore, the electronic cigarette smoking rate has increased recently. What is more, many studies have reported only secondhand smoking exposure in the household but they didn't look into how each family member who smoked influenced student smoking behavior. This study has analyzed the relationship between the smoking status of Korean adolescent's parents and friends and their smoking behavior.

Ⅱ. Methods

A. Data source

This study used the 10th Korea Youth Risk Behavior Web-based Survey (2014). The 2014 KYRBWS was conducted by the Korean Centers for Disease Control and Prevention every year since 2005. In 2014, a three-stage cluster-sample design was used to obtain a nationally representative sample. Four hundred middle and high schools were selected as sample students. The total population of the sample selected came to 74,176. All students in the sample class except long-absent, special needs and dyslexic students were selected as sample students. Finally, 72,060 adolescents have participated in this study. It was conducted in school computer labs connected to the internet. Questionnaire private access keys were allocated to each student and distributed by the teachers. We analyzed the survey samples of a total of 72,060 students for this survey.

B. Variables

1. General characteristics

The socio-demographic characteristics included were school year (middle 1st, middle 2nd, middle 3rd, high 1st, high 2nd, high 3rd), school record (high, medium, low), perceived economic status (high, medium, low), family structure (single parents, both parents, other), father's education (<high school, college, don't know), mother's education (<high school, college, don't know). Health-related characteristics were frequency of alcohol consumption within the last 30days (none, 1-5 days, 6-9 days, ≧10 days), frequency of intense physical activity (none, 1-2 days, ≧ 3days), and disease history (asthma, allergic rhinitis, atopy dermatitis) and stress level (high, low).

2. Family and friends smoking status

The smoking status of family and friends were second hand smoke exposure in household (none, 1-2 days, ≧3 days), family smoking status, friends smoking status (none, some, most/all), and witnessed smoking at school (no, yes). When there were any family members who smoked, it was sub-categorized as fathers, mothers, siblings, grandparents and others.

3. Smoking behavior

We assessed whether students have ever smoked cigarettes at any time in their life and also whether they started smoking before middle school age. We defined the students who smoked at least one day during the past 30days prior to the survey as current smokers. The use of electronic

cigarettes was assessed. Current electronic cigarettes use was defined as smoking within the past 30days prior to the survey.

C. Data analysis

All data analyses were performed using by SPSS software (version 18) and stratified by gender. Cross-tabulations were used to obtain frequencies, percentages and chi-square for general characteristics, smoking-related characteristics, the influence of family and friends on the students lifetime smoking habits and current smoking habits and before middle school smoking experience including electronic cigarette experience. Finally, multiple logistic regression analysis was used for adolescents' smoking behaviors.

Ⅲ. Result

A. General characteristics by sex

In this study, 50.6% of boys and 53.5% of girls reported that they achieved a medium level of academic success. For the question on their perceived economic status the answer most frequently given by students was middle. The number of respondents who indicated that their father's highest education level was college was 48.8% boys and 49.1% girls. The number of girl students who indicated that their mother's education level was high school or below was 43.7%. For the family structure, 85.4% of boy and girl students had both parents. The proportion of respondents who answered 'none' to frequency of alcohol consumption within the last 30days was 80.5% boys and 87.4% girls. The percentage of girl adolescents who responded '1-2/day' to frequency of intense physical activity was 41.8% ($p<0.001$). The percentage of students who responded '≧3/day' to frequency of intense physical activity was 49.5% boys and 25.0% girls. Furthermore, the percentages of boy and girl respondents with allergic rhinitis was 31.5% and 32.8% respectively Percentages of perceived high stress levels was significantly higher in girls than in boys (Table 1).

Table 1. General characteristics by sex

Characteristics	Boys (n=36470)	Girls (n=35590)	p-value
School year			
Middle 1st	6078(16.7)	5583(15.7)	<0.001
Middle 2nd	6331(17.4)	5944(16.7)	
Middle 3rd	6154(16.9)	6066(17.0)	
High 1st	6048(16.6)	5776(16.2)	
High 2nd	6009(16.5)	6143(17.3)	
High 3rd	5850(16.0)	6078(17.1)	
School record			
High	13660(37.5)	13063(36.7)	<0.001
Medium	18471(50.6)	18995(53.5)	
Low	4339(11.9)	3532(9.9)	
Perceived economic status			
High	13143(36.0)	10802(30.4)	<0.001
Middle	16906(46.4)	18134(51.0)	
Low	6421(17.6)	6654(18.7)	
Family structure			
Lives with single parents	4640(12.7)	4776(13.4)	<0.001
Lives with both parents	31146(85.4)	30385(85.4)	
Lives with other	684(1.9)	429(1.2)	
Father's education			
<High school	11469(32.9)	12132(35.5)	<0.001
College	17014(48.8)	16780(49.1)	
Don't know	6347(18.2)	5283(15.4)	
Mother's education			
< High school	13682(37.5)	15554(43.7)	<0.001
College	14587(40.0)	14081(39.6)	
Don't know	8201(22.5)	5955(16.7)	
Alcohol drinking frequency			
None	29349(80.5)	31099(87.4)	<0.001
1-5 days	5412(14.8)	3686(10.4)	
6-9 days	818(2.2)	383(1.1)	
≧10days	891(2.4)	422(1.2)	
Frequency of intense physical activity			
None	4978(13.6)	11824(33.2)	<0.001
1-2/day	13442(36.9)	14883(41.8)	
≧3/day	18050(49.5)	8883(25.0)	
Disease history			
Asthma	3807(10.4)	2709(7.8)	<0.001
Allergic rhinitis	11488(31.5)	11689(32.8)	<0.001
Atopy dermatitis	7418(20.3)	9814(27.6)	<0.001
Stress level			
High	11124(30.5)	15580(43.8)	<0.001
Low	25346(69.5)	20010(56.2)	

Data were expressed as number(%).

B. Smoking-related characteristics by sex

The proportion of students who answered '≧3' to having been exposed to second hand smoke in the household as days per week was 16.7% boys and 19.5% girls ($p<0.001$). More than half of the subjects responded affirmatively to having family smokers. The percentage of boy and girl respondents who responded 'yes' to having fathers who smoke was 46.4% and 48.4% respectively. 69.6% of girl students responded 'none' to friends who smoke. While 43.6% of boy respondents answered 'most/all' to friends who smoke. The proportion of boy and girl students who answered 'yes' to having witnessed smoking at school was 43.9% and 35.9% respectively ($p<0.001$). Percentages of lifetime smoking experience and current smoking were both significantly higher in boys than in girls. The percentage of boy and girl respondents who responded 'yes' to having smoking experience before middle school was 8.3% and 3.0% respectively ($p<0.001$). The proportion of boy and girl students who answered 'yes' to having electronic cigarette smoking experience was 13.7% and 3.3% respectively (Table 2).

Table 2. Smoking-related characteristics by sex

Characteristics	Boys (n=36470)	Girls (n=35590)	p
Second hand smoke exposure in household (week)			
None	24374(66.8)	22934(64.4)	<0.001
1-2 days	6013(16.5)	5713(16.1)	
≧3 days	6083(16.7)	6943(19.5)	
Family smoking status			
No	15991(43.8)	14618(41.1)	<0.001
Yes(any family members who smoke)	20479(56.2)	20972(58.9)	
Fathers	16934(46.4)	17242(48.4)	
Mothers	1061(2.9)	1297(3.6)	
Siblings	2169(5.9)	2348(6.6)	
Grandparents	2320(6.4)	2698(7.6)	
Others	2374(6.5)	2284(6.4)	
Friends smoking status			
None	14940(41.0)	24761(69.6)	<0.001
Some	15897(43.6)	9054(25.4)	
Most/all	5633(15.4)	1775(5.0)	
Witnessed smoking at school			
No	20455(56.1)	22807(64.1)	<0.001
Yes	16015(43.9)	12783(35.9)	
Lifetime smoking experience			
No	26318(72.2)	31775(89.3)	<0.001
Yes	10152(27.8)	3815(10.7)	
Current smoking			
No	31611(86.7)	34142(95.9)	<0.001
Yes	4859(13.3)	1448(4.1)	
Smoking experience before middle school			
No	33403(91.7)	34523(97.0)	<0.001
Yes	3037(8.3)	1051(3.0)	
Electronic cigarette smoking experience			
No	31468(86.3)	34430(96.7)	<0.001
Yes	5002(13.7)	1160(3.3)	
Current electronic cigarette smoking experience			
No	33733(92.5)	35051(98.5)	<0.001
Yes	2737(7.5)	539(1.5)	

Data were expressed as number(%).

C. Smoking behavior of adolescents by family and friends smoking status

1. Lifetime smoking experience

The result of a simple comparative analysis of students who did and those who did not report smoking life experience. Of boy students 25.8% who had smoking experience responded '1-2days' to second hand smoke exposure ($p<0.001$). Regarding students with family who smoke, the percentage of their smoking experience were greatest amongst boys in the siblings group and girls in the mothers group ($p<0.001$). While the girl students who were in the '≧3 days' category were the most likely to have experienced smoking. When exposed to second hand smoke for 1-2days per week boys were twice as likely as girls to have experienced smoking. When the subjects had most/all friends who smoked, they were more likely to have experienced smoking. Furthermore, adolescents who had smoking experience were more likely to have had witnessed smoking at school ($p<0.001$) (Table 3).

Table 3. Lifetime smoking experience by family and friends smoking status

Characteristics	Boys			Girls		
	No	Yes	p	No	Yes	p
Second hand smoke exposure (d/week)						
None	18263(74.9)	6,111(25.1)	<0.001	21000(66.1)	1934(8.4)	<0.001
1-2	4462(74.2)	1511(25.8)		5102(16.1)	611(10.7)	
≥3	3596(59.1)	2490(40.9)		5637(81.7)	1270(18.3)	
Family smoking status						
No	12070(75.5)	3921(24.5)	<0.001	13439(91.9)	1179(8.1)	<0.001
Yes	14248(69.6)	6231(30.4)		18336(87.4)	2636(12.6)	
Fathers						
No	14474(74.1)	5062(25.9)	<0.001	16612(90.5)	1736(9.5)	<0.001
Yes	11844(69.9)	5090(30.1)		15163(87.9)	2079(12.1)	
Mothers						
No	25747(72.7)	9662(27.3)	<0.001	30885(90.1)	3408(9.9)	<0.001
Yes	571(53.8)	490(46.2)		890(68.6)	407(31.4)	
Siblings						
No	25344(73.9)	8957(26.1)	<0.001	30112(90.6)	3130(9.4)	<0.001
Yes	974(44.9)	1195(55.1)		1663(70.8)	685(29.2)	
Grandparents						
No	24674(72.3)	9476(27.7)	<0.001	29406(89.4)	3486(10.6)	<0.001
Yes	1644(70.9)	676(29.1)		2369(87.8)	329(12.2)	
Friends smoking status						
None	13532(90.6)	1408(9.4)	<0.001	23881(96.4)	880(3.6)	<0.001
Some	11169(70.3)	4728(29.7)		7223(79.8)	1831(20.2)	
Most/All	1617(28.7)	4016(71.3)		671(37.8)	1104(62.2)	
Witnessed smoking at school						
No	16162(79.0)	4293(21.0)	<0.001	20808(91.2)	1999(8.8)	<0.001
Yes	10156(63.4)	5859(36.6)		10967(85.8)	1816(14.2)	

Data were expressed as number(%).

2. Current smoking experience

All results are statistically significant. The category with the greatest exposure to second hand smoking in the home was boys and girls in the '≧3 days' group. When exposed to second hand smoke for 1-2 days per week boys were almost four times as likely as girls to have current smoking experience. 53.9% of boys who had current smoking experience answered affirmatively to having most/all friends who smoke. Regarding adolescents with any family members who smoke, the percentage of their current smoking experience was greatest amongst boys in the siblings group and girls in the mothers group ($p<0.001$). Adolescents with higher exposure to second hand smoke had a higher likely hood of being a current smoker. When students had most/all friends who smoked, they were more likely to have current smoking experience. Regarding subjects who witnessed smoking at school, the percentages of boy and girl students who had current smoking experience were 19.6% and 6.0% respectively ($p<0.001$). Overall all categories, percentages of current smoking experience were all significantly higher in boys than in girls (Table 4).

Table 4. Current smoking by family and friends smoking status

Characteristics	Boys			Girls		
	No	Yes	p	No	Yes	p
Secondhand smoke exposure (d/week)						
None	21677(88.9)	2697(11.1)	<0.001	22303(97.2)	631(2.8)	<0.001
1-2	5335(88.7)	678(11.3)		5504(96.3)	209(3.7)	
≥3	4599(75.6)	1484(24.4)		6335(91.2)	608(8.8)	
Family smoking status						
No	14240(89.1)	17511(10.9)	<0.001	14217(97.3)	401(2.7)	<0.001
Yes	17371(84.8)	3108(15.2)		19925(95.0)	1047(5.0)	
Fathers						
No	17156(87.8)	2380(12.2)	<0.001	17692(96.4)	656(3.6)	<0.001
Yes	14455(85.4)	2479(14.6)		16450(95.4)	792(4.6)	
Mothers						
No	30859(87.2)	4550(12.8)	<0.001	33036(96.3)	1257(3.7)	<0.001
Yes	752(70.9)	309(29.1)		1106(85.3)	191(14.7)	
Siblings						
No	30197(88.0)	4104(12.0)	<0.001	32123(96.6)	1119(3.4)	<0.001
Yes	1414(65.2)	755(34.8)		2019(86.0)	329(14.0)	
Grandparents						
No	29652(86.8)	4498(13.2)	<0.001	31603(96.1)	1289(3.9)	<0.001
Yes	1959(84.4)	361(15.6)		2539(94.1)	159(5.9)	
Friends smoking status						
None	14732(98.6)	208(1.4)	<0.001	24683(99.7)	78(0.3)	<0.001
Some	14283(89.8)	1614(10.2)		8495(93.8)	559(6.2)	
Most/All	2596(46.1)	3037(53.9)		964(54.3)	811(45.7)	
Witnessed smoking at school						
No	18730(91.6)	1725(8.4)	<0.001	22122(97.0)	685(3.0)	<0.001
Yes	12881(80.4)	3134(19.6)		12020(94.0)	763(6.0)	

Data were expressed as number(%).

3. Smoking experience middle school

Second hand exposure in the ≧3 group (14.9%, $p<0.001$) was statistically considerable than that of in the 1-2 days group (7.8%, $p<0.001$) in boys. With respect to any family members who smoke, the percentages of boy students who had smoking experience before middle school was 9.5%. Furthermore, regarding any family members who smoke, the percentage of their smoking experience before middle school was the greatest amongst boys in the siblings group and girls in the mothers group ($p<0.001$). Adolescents with a great number of friends who smoke had a higher likely-hood of smoking experience before middle school. The percentages of subjects who witnessed smoking at school were 10.9% in boys and 3.9% in girls for smoking experience before middle school (Table 5).

Table 5. Smoking experience before middle school by family and friends smoking status

Characteristics	Boys			Girls		
	No	Yes	p	No	Yes	p
Second hand smoke exposure (d/week)						
None	22714(93.2)	1660(6.8)	<0.001	22478(98.0)	456(2.0)	<0.001
1-2	5541(92.2)	472(7.8)		5542(97.0)	171(3.0)	
≥3	5178(85.1)	905(14.9)		6519(93.9)	424(6.1)	
Family smoking status						
No	14902(93.2)	1089(6.8)	<0.001	14338(98.1)	280(1.9)	<0.001
Yes	18531(90.5)	1948(9.5)		20201(96.3)	771(3.7)	
Fathers						
No	18028(92.3)	1508(7.7)	<0.001	17889(97.5)	459(2.5)	<0.001
Yes	15405(91.0)	1529(9.0)		16650(96.6)	592(3.4)	
Mothers						
No	32577(92.0)	2832(8.0)	<0.001	33388(97.4)	905(2.6)	<0.001
Yes	856(80.7)	205(19.3)		1151(88.7)	146(11.3)	
Siblings						
No	31714(92.5)	2587(7.5)	<0.001	32401(97.5)	841(2.5)	<0.001
Yes	1719(79.3)	450(20.7)		2138(91.1)	210(8.9)	
Grandparents						
No	31365(91.8)	2785(8.2)	<0.001	31973(97.2)	919(2.8)	<0.001
Yes	2068(89.1)	252(10.9)		2566(95.1)	132(4.9)	
Friends smoking status						
None	14312(95.8)	628(4.2)	<0.001	24440(98.7)	321(1.3)	<0.001
Some	14673(92.3)	1224(7.7)		8642(95.4)	412(4.6)	
Most/All	4448(79.0)	1185(21.0)		1457(82.1)	318(17.9)	
Witnessed smoking at school						
No	19157(93.7)	1298(6.3)	<0.001	22252(97.6)	555(2.4)	<0.001
Yes	14276(89.1)	1739(10.9)		12287(96.1)	496(3.9)	

Data were expressed as number(%).

4. Electronic cigarette smoking experience

Percentages of all categories were significantly higher in boys than in girls ($p<0.001$). When exposed to second hand smoke in the home for 1-2days per week boys were approximately 3 times as likely as girls to have electronic smoking experience ($p<0.001$). Students with higher exposure to second hand smoke in the home, had a higher likely-hood of having electronic smoking experience. Regarding any family members who smoke, the percentages of boy and girl students who had electronic smoking experience was 15.6% and 4.0% respectively. Furthermore, with respect to any family members who smoke, the percentages of their electronic smoking experience was the greatest amongst boys in the siblings group and girls in the mothers group ($p<0.001$). Adolescents with a great number of friends who smoke had a higher likely hood of electronic smoking experience. More than half of boy students with electronic smoking experience had 'most/all' friends who smoke (Table 6).

Table 6. Electronic cigarette smoking experience by family and friends smoking status

Variables	Boys			Girls		
	No	Yes	p	No	Yes	p
Second hand smoke exposure (d/week)						
None	21592(88.6)	2782(11.4)	<0.001	22453(97.9)	481(2.1)	<0.001
1-2	5256(87.4)	757(12.6)		5541(97.0)	172(3.0)	
≥3	4620(75.9)	1463(24.1)		6436(92.7)	507(7.3)	
Family smoking status						
No	14177(88.7)	1814(11.3)	<0.001	14298(97.8)	320(2.2)	<0.001
Yes	17291(84.4)	3189(15.6)		20132(96.0)	840(4.0)	
Fathers						
No	17085(87.5)	2451(12.5)	<0.001	17823(97.1)	525(2.9)	<0.001
Yes	14383(84.9)	2551(15.1)		16607(96.3)	635(3.7)	
Mothers						
No	30693(86.7)	4716(13.3)	<0.001	33289(97.1)	1004(2.9)	<0.001
Yes	775(73.0)	286(27.0)		1141(88.0)	156(12.0)	
Siblings						
No	30053(87.6)	4248(12.4)	<0.001	32323(97.2)	919(2.8)	<0.001
Yes	1415(65.2)	754(34.8)		2107(89.7)	241(10.3)	
Grandparents						
No	29499(86.4)	4651(13.6)	<0.001	31882(96.9)	1010(3.1)	<0.001
Yes	1969(84.9)	351(15.1)		2548(94.4)	150(5.6)	
Friends smoking status						
None	14570(97.5)	370(2.5)	<0.001	24597(99.3)	164(0.7)	<0.001
Some	14169(89.1)	1728(10.9)		8676(95.8)	378(4.2)	
Most/All	2729(48.4)	2904(51.6)		1157(65.2)	618(34.8)	
Witnessed smoking at school						
No	18641(91.1)	1814(8.9)	<0.001	22286(97.7)	521(2.3)	<0.001
Yes	12827(80.1)	3188(19.9)		12144(95.0)	639(5.0)	

Data were expressed as number(%).

5. Current electronic cigarette smoking experience

Percentages of all categories were significantly higher in boys than in girls ($p<0.001$). When exposed to second hand smoke in the home for 1-2days per week boys were approximately 5 times as likely as girls to have electronic smoking experience ($p<0.001$). Students with higher exposure to second hand smoke in the home, had a higher likely-hood of having current electronic smoking experience. Regarding any family members who smoke, the percentages of boy and girl students who had electronic smoking experience was 8.7% and 1.9% respectively. Furthermore, with respect to any family members who smoke, the percentages of their current electronic smoking experience was the greatest amongst boys in the siblings group and girls in the mothers group ($p<0.001$). Adolescents with a great number of friends who smoke had a higher likely hood of electronic smoking experience. 33.9%of boy students with electronic smoking experience had 'most/all' friends who smoke The percentages of subjects who witnessed smoking at school were 11.6% in boys and 2.5% in girls for current electronic cigarette smoking experience (Table 7).

Table 7. Current electronic cigarette smoking experience by family and friends smoking status

Variables	Boys			Girls		
	No	Yes	p	No	Yes	p
Second hand smoke exposure (d/week)						
None	22935(94.1)	1439(5.9)	<0.001	22740(99.2)	194(0.8)	<0.001
1-2	5629(93.6)	384(6.4)		5637(98.7)	76(1.3)	
≥3	5169(85.0)	914(15.0)		6674(96.1)	269(3.9)	
Family smoking status						
No	15038(94.0)	953(6.0)	<0.001	14476(99.0)	142(1.0)	<0.001
Yes	18695(91.3)	1784(8.7)		20575(98.1)	397(1.9)	
Fathers						
No	18204(93.2)	1332(6.8)	<0.001	18079(98.5)	269(1.5)	<0.001
Yes	15529(91.7)	1405(8.3)		16972(98.4)	270(1.6)	
Mothers						
No	32862(92.8)	2547(7.2)	<0.001	33833(98.7)	460(1.3)	<0.001
Yes	871(82.1)	190(17.9)		1218(93.9)	79(6.1)	
Siblings						
No	32023(93.4)	2278(6.6)	<0.001	32843(98.8)	399(1.2)	<0.001
Yes	1710(78.8)	459(21.2)		2208(94.0)	140(6.0)	
Grandparents						
No	31610(92.6)	2540(7.4)	<0.001	32447(98.6)	445(1.4)	<0.001
Yes	2123(91.5)	197(8.5)		2604(96.5)	94(3.5)	
Friends smoking status						
None	14817(99.2)	123(0.8)	<0.001	24724(99.9)	34(0.1)	<0.001
Some	15192(95.6)	705(4.4)		8936(98.7)	118(1.3)	
Most/All	3724(66.1)	1909(33.9)		1388(78.2)	387(21.8)	
Witnessed smoking at school						
No	19569(95.7)	886(4.3)	<0.001	22589(99.0)	228(1.0)	<0.001
Yes	14164(88.4)	1851(11.6)		12462(97.5)	321(2.5)	

Data were expressed as number(%).

D. Odds ratios for smoking behavior

1. Lifetime smoking experience

Girl students who were exposed to second hand smoke in households for 1-2days per week had a greater odds ratio than if they weren't exposed (OR=1.14, 95% CI:1.02-1.27). Students who had any family that smoked were more likely to have lifetime smoking habits than those with family who didn't. Furthermore, with respect to any family members who smoke, the odds ratios of their smoking experience was the greatest amongst boys in the siblings group (OR=2.22, 95% CI:1.99-2.46) and girls in the mothers group (OR=2.79, 95% CI:2.38-3.26). Boy students who had most/all friends that smoke were more likely to have lifetime smoking habits than their peers who didn't smoke (OR=19.3, 95% CI:16.8-22.1). Girl students who had some friends that smoke were more likely to have lifetime smoking habits than their peers who didn't smoke (OR=4.71, 95% CI:4.28-16.8) (Table 8).

Table 8. Odds ratios (95% CI) for lifetime smoking experience

Characteristics	Boys		Girls	
	OR	95% CI	OR	95% CI
Secondhand smoke exposure in household (/none)				
1-2days	0.86	0.77-0.95	1.03	0.85-1.25
≧3days	1.80	1.65-1.97	1.78	1.54-2.06
Family smoking status(/no)				
Yes	1.24	1.17-1.31	1.39	1.27-1.51
Fathers	1.18	1.12-1.25	1.18	1.09-1.28
Mothers	1.60	1.37-1.87	2.79	2.38-3.26
Siblings	2.22	1.99-2.46	2.46	2.18-2.77
Grandparents	1.10	0.98-1.23	1.07	0.92-1.24
Friends smoking status (/no)				
Some	3.17	2.95-3.42	4.71	4.28-16.8
Most/all	12.29	11.19-13.50	19.31	16.82-22.18
Witnessed smoking at school(/no)				
Yes	1.65	1.56-1.74	1.33	1.23-1.44

Adjusting for grade, self-rated school records, perceived socioeconomic status, family structure, father and mother's education, alcohol drinking frequency, frequency of intense physical activity, disease history and stress level.

2. Current smoking experience

Boy students who were exposed to second hand smoke in households for 1-2days per week had a greater odds ratio than if they weren't exposed (OR=0.94, 95% CI:0.88-1.02). Furthermore, with respect to any family members who smoke, the odds ratios of their smoking experience was the greatest amongst boys in the siblings group (OR=2.26, 95% CI:2.00-2.55) and girls in the mothers group (OR=2.41, 95% CI:1.92-3.03). Girl students who had 'most/all' friends that smoke were more likely to have current smoking habits than their peers who didn't smoke (OR=96.94, 95% CI:72.80-129.09). When 'most/all' friends that smoke girls were over twice as likely as boys to have current smoking experience. Boy Students with higher exposure to second hand smoke in the home had a higher likely-hood of having current smoking experience (OR=1.85, 95% CI:1.71-2.00) (Table 9).

Table 9. Odds ratios (95% CI) for current smoking experience

Characteristics	Boys		Girls	
	OR	95% CI	OR	95% CI
Secondhand smoke exposure in household (/none)				
1-2days	0.94	0.88-1.02	1.14	1.02-1.27
≧3days	1.58	1.47-1.70	1.67	1.52-1.83
Family smoking status(/no)				
Yes	1.29	1.20-1.40	1.43	1.24-1.65
Fathers	1.19	1.10-1.28	1.10	0.96-1.26
Mothers	1.85	1.53-2.23	2.41	1.92-3.03
Siblings	2.26	2.00-2.55	2.23	1.87-2.65
Grandparents	1.24	1.07-1.44	1.31	1.04-1.64
Friends smoking status (/no)				
Some	6.51	5.49-7.72	12.50	9.50-16.46
Most/all	41.78	35.04-49.82	96.94	72.80-129.09
Witnessed smoking at school(/no)				
Yes	1.85	1.71-2.00	1.40	1.22-1.60

Adjusting for grade, self-rated school records, perceived socioeconomic status, family structure, father and mother's education, alcohol drinking frequency, frequency of intense physical activity, disease history and stress level.

3. Smoking experience before middle school

Boy students who were exposed to second hand smoke in households for 3days per week had a greater odds ratio than if they weren't exposed (OR=1.68, 95% CI:1.52-1.85). Moreover, with respect to any family members who smoke, the odds ratios of their smoking experience was the greatest amongst boys in the siblings group (OR=2.29, 95% CI:2.01-2.61) and girls in the mothers group (OR=2.66, 95% CI:2.12-3.33). For second hand smoke exposure in the household, girl students had a similar trend as boys. Girl students who had 'most/all' friends that smoke were more likely to have smoking experience before middle school than their peers who didn't smoke (OR=9.40, 95% CI:7.53-11.72). Students with higher exposure to second hand smoke in the home, had a higher likely-hood of having smoking experience before middle school (boys: OR=1.58, 95% CI:1.45-1.72, girls: OR=1.31, 95% CI:1.14-1.51) (Table 10).

Table 10. Odds ratios (95% CI) for smoking experience before middle school

Characteristics	Boys		Girls	
	OR	95% CI	OR	95% CI
Secondhand smoke exposure in household (/none)				
1-2days	1.01	0.90-1.14	1.29	1.06-1.57
≧3days	1.68	1.52-1.85	2.01	1.72-2.36
Family smoking status(/no)				
Yes	1.20	1.10-1.31	1.62	1.38-1.90
Fathers	1.08	0.99-1.17	1.29	1.12-1.49
Mothers	1.69	1.39-2.05	2.66	2.12-3.33
Siblings	2.29	2.01-2.61	2.34	1.93-2.82
Grandparents	1.19	1.01-1.39	1.40	1.12-1.75
Friends smoking status (/no)				
Some	2.33	2.07-2.61	3.34	2.81-3.96
Most/all	5.64	4.92-6.47	9.40	7.53-11.72
Witnessed smoking at school(/no)				
Yes	1.58	1.45-1.72	1.31	1.14-1.51

Adjusting for grade, self-rated school records, perceived socioeconomic status, family structure, father and mother's education, alcohol drinking frequency, frequency of intense physical activity, disease history and stress level.

4. Electronic cigarette smoking experience

For any family members who smoke, the odds ratios of their electronic cigarette smoking experience was the greatest amongst boys in the siblings group (OR=2.32, 95% CI:2.06-2.60) and girls in the mothers group (OR=2.48, 95% CI:1.97-3.13). Boy students who had 'most/all' friends that smoke were more likely to have electronic cigarette smoking experience than their peers who didn't smoke (OR=17.85, 95% CI:15.61-20.41). Futhermore, girl students with 'most/all' friends that smoke had greater odds ratio than that's of none in boys (OR=2.20, 95% CI:1.88-2.56) (Table 11).

Table 11. Odds ratios (95% CI) for electronic cigarette smoking experience

Characteristics	Boys		Girls	
	OR	95% CI	OR	95% CI
Secondhand smoke exposure in household (/none)				
1-2days	1.03	0.93-1.14	1.21	0.99-1.48
≧3days	1.78	1.63-1.94	2.20	1.88-2.56
Family smoking status(/no)				
Yes	1.34	1.24-1.44	1.51	1.30-1.76
Fathers	1.21	1.13-1.30	1.22	1.07-1.41
Mothers	1.65	1.38-1.98	2.48	1.97-3.13
Siblings	2.32	2.06-2.60	2.00	1.67-2.41
Grandparents	1.15	0.99-1.33	1.50	1.20-1.88
Friends smoking status (/no)				
Some	3.27	2.88-3.72	4.25	3.45-5.23
Most/all	17.85	15.61-20.41	30.91	24.77-38.56
Witnessed smoking at school(/no)				
Yes	1.75	1.62-1.88	1.54	1.34-1.77

Adjusting for grade, self-rated school records, perceived socioeconomic status, family structure, father and mother's education, alcohol drinking frequency, frequency of intense physical activity, disease history and stress level.

5. Current electronic cigarette smoking experience

Students with higher exposure to second hand smoke in the home, had a higher likely-hood of having current electronic cigarette smoking experience (boys: OR=1.84, 95% CI:1.65-2.04, girls: OR=2.38, 95% CI:1.90-2.99). For any family members who smoke, the odds ratios of their electronic cigarette smoking experience was the greatest amongst students in the siblings group (boys: OR=2.08, 95% CI:1.81-2.39, girls: OR=2.49, 95% CI:1.95-3.18). Boy students who had 'most/all' friends that smoke were more likely to have current electronic cigarette smoking experience than their peers who didn't smoke (OR=23.15, 95% CI:18.70-28.66). Futhermore, girl students with 'most/all' friends that smoke had greater odds ratio than that's of none in boys (OR=71.69, 95% CI:46.77-109.89) (Table 12).

Table 12. Odds ratios (95% CI) for current electronic cigarette smoking experience

Characteristics	Boys		Girls	
	OR	95% CI	OR	95% CI
Secondhand smoke exposure in household (/none)				
1-2days	1.00	0.88-1.15	1.25	0.92-1.70
≧3days	1.84	1.65-2.04	2.38	1.90-2.99
Family smoking status(/no)				
Yes	1.34	1.21-1.47	1.49	1.18-1.87
Fathers	1.18	1.08-1.30	0.96	0.78-1.18
Mothers	1.73	1.39-2.14	2.29	1.66-3.16
Siblings	2.08	1.81-2.39	2.49	1.95-3.18
Grandparents	1.31	0.89-1.31	1.87	1.38-2.54
Friends smoking status (/no)				
Some	3.65	2.95-4.52	6.27	4.06-9.67
Most/all	23.15	18.70-28.66	71.69	46.77-109.89
Witnessed smoking at school(/no)				
Yes	1.88	1.71-2.07	1.60	1.30-1.97

Adjusting for grade, self-rated school records, perceived socioeconomic status, family structure, father and mother's education, alcohol drinking frequency, frequency of intense physical activity, disease history and stress level.

Ⅳ. Discussion

Adolescent smoking is a significant public health concern in the world. In order to analyze the relationship between the smoking status of Korean adolescent's parents and friends and their smoking behaviour, the 10th Korea Youth Risk Behavior Web-based Survey (KYRBS), 2014 was used.

In this Korean representative study, 11.2% of boy students and 3.4% of girl students were current smokers. When compared to OECD data of the Swedish population, just 10.7% of people aged over 15 years were daily smokers (OECD, 2016) even though the Korean smoking rate was lower than that of the average OECD countries (16.0%). Also the proportion of boys who were current smokers was higher than that of United Kingdom (10.0%) and Canada (8%) (Statistics Korea, 2016). The age of smoking initiation in this study was 13.5 years old which was younger than that of 14.1 years old in 2005 (Lee, 2016). The age of smoking initiation has been getting younger in Korea and these results were consistent with a previous Canadian study that showed the age of smoking initiation was at 13.7 years old (Azagba, et al., 2015).

In the present study, the odds ratios of adolescents' current smoking experience was the greatest amongst boys in the siblings group (OR=2.26, 95% CI:2.00-2.55) and girls in the mothers group (OR=2.41, 95% CI:1.92-3.03), if there were any family members who smoked. The same result was found in previous studies that if parents smoke, their children were more likely to smoke. Parenting continues to be an important factor related to adolescent smoking. The likelihood of adolescents smoking is increased when the parents smoke (Simons-Morton & Farhat., 2010; Piko & Balázs, 2011). According to a study, in 20 school districts in Washington State 18.6% of 12th graders smoked if neither parent smoked

and 31.8% smoked if a parent smoked. The influential effect of smoking on the adolescent that had parents who smoke was stronger with the mother than the father (Leonardi-Bee, et.al., 2011). If no parent smoked and an older sibling smoked the OR that the 12th grader would smoke was 1.85 and if a parent smoked 1.49 (Thomas, et al., 2016). The current representative study has showed that adolescent smoking can be significantly determined by influence of the parent. Therefore family smoking is a crucial factor that effects adolescent smoking behavior and it is suggested that when it comes to family smoking, relationships between adolescents and family members need to be considered.

The current representative study has shown that if adolescents had friends who smoked, they were more likely to smoke, also some studies have found that peer smoking had a relationship between peer smoking and adolescents smoking as well as initiation of smoking (Mak et al., 2012). The present study did not consider the interactions and relationships between the students and their friends because we did not have a friendship variable. One study suggested that mutual or reciprocated type of friends relationship have stronger affects than directional relations on adolescent smoking behaviors (Fujimato & Valente, 2011). Consequently, further research needs to be done to assess the influence of other relationship types such as friendships on adolescents smoking behavior.

Our study has revealed that adolescents were more likely to smoke if they had witnessed smoking at school. In regards to smoking, adolescents could be influenced by their school environment in two ways, directly and indirectly. Direct approval happens when students smoked themselves, this sends the message that it was acceptable to smoke. Indirect approval occurs when a person had been witness to smoking behavior in others around them and accepts it. i.e. Teachers smoking in the staff room or on school grounds where it was possible for students to smell or be aware of it happening. This sent an indirect pro-smoking message (Bellatorre, et

al., 2015). Adolescents can be easily affected by school environments because they spend a lot of time at school. Previous research has proven that smoke-free school environments had a lower prevalence of smoking consequently, lessor overall cigarette consumption than schools with minimal guidelines (Lovato, et al., 2010). Thus, smoke-free school environments are important to control adolescents' smoking behavior.

There were several limitations in these findings to interpret. Firstly, this study might have bias due to data which is based on self-reported format. For example, some questions might have been answered in a socially acceptable manner, especially smoking, some students may have reported lower or higher frequencies. Secondly, since this study is based on the cross-sectional study, especially smoking to examine the putative cause and effect and it was not possible to do so but there might be a possibility that adolescent smokers have a tendency to get close to friends who smoke. Thirdly, this study did not look into students' popularity. According to some studies smoking is related to adolescents popularity among their peer group. ie, they may have a tendency to copycat popular students (Simons-Morton & Farhat, 2010,;Green et al., 2012). Finally, we didn't have a parenting style variable but it has been proven that boys without parental control may have a tendency for substance use. Whereas for girls, the quality of the relationship between their parents and themselves was more relevant (Thomas et al., 2015).

This representative study however, analyzed adolescent smoking behavior in korea and the target population focus was middle and high school students nationwide, also many pervious studies did not consider the relationship between household smoking and adolescent smoking behavior. What is more, this study has investigated how each individual family member who smoked influenced student smoking behavior in Korea also we have looked into a variety of smoking behaviors such as the electronic cigarette smoking rate which has increased in Korean adolescents.

Ⅴ. Summary and conclusion

Smoking is harmful to the health of adolescents because their bodies are still growing. The aim of this study was to analyze the association between the smoking status of Korean adolescent's parents and friends and their smoking behaviour.

The target population of the study was a nationwide sample of 72,060 middle and high students. Chi-square tests and multiple logistic regression analysis was used to reveal the association between smoking status of family and friends smoking and adolescents' smoking behavior.

The current representative study revealed with respect to any family members who smoke, the odds ratio for adolescents current smoking experience was the greatest amongst boys in the sibling groups (OR=2.26, 95% CI:2.00-2.55) and girls in the mothers group (OR=2.41, 95% CI:1.92-3.03). Regarding students with family who smoked boys were affected by their siblings whereas girls were more influenced by their mothers. Adolescents with higher exposure to second hand smoke, had a higher likely-hood of having smoking experience. Students with more friends or had witnessed smoking at school had a higher likely-hood of taking up smoking.

The smoking status of family and friends was significantly related to adolescents smoking behaviour. Family environment and friendships should be considered to control adolescents smoking.

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