


BMJ Open Factors associated with adolescents' sexual experience based on the biopsychosocial model: a cross-sectional study using the Korea Youth Risk Behavior Web-based Survey (KYRBS)

Ka Young Kim ,¹ Hye Young Shin ²

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¹Department of Nursing, College of Nursing, Gachon University, Incheon, Republic of Korea

²Department of Nursing, Gangseo University, Seoul, Republic of Korea

Correspondence to

Professor Hye Young Shin; hs103740@gmail.com

ABSTRACT

Objectives Sexual activity is an important integrative behaviour that interacts with biological, psychological and social factors among various changes in adolescence. However, starting sex at an early age is associated with adverse outcomes. Thus, this study aimed to investigate the factors associated with adolescents' sexual experience based on the biopsychosocial model.

Design A cross-sectional study.

Setting The participants were selected through a complex sample design at high schools and middle schools nationwide in Korea.

Participants We employed 4-year data (2017–2020) of the cross-sectional Korea Youth Risk Behavior Web-based Survey. In total, 234567 participants attending middle school and high school were analysed. Sexual experience was defined as having had sexual intercourse (oral, anal or vaginal) in their lifetime. To identify variables associated with adolescents' sexual experiences, we used a biopsychosocial model. Logistic regression analysis was performed to identify the variables associated with sexual experience.

Results 3.4% of boys and 1.6% of girls attending middle school had sexual experiences, showing a significant difference. A total of 10.4% of boys and 5.1% of girls attending high school had sexual experiences ($p < 0.001$). Among the biological factors of the biopsychosocial model, age and gender were significantly associated with sexual experiences in adolescents. Regarding the psychological factors, suicidal thoughts were a significant risk factor associated with sexual experience. Furthermore, social factors including drinking, smoking and family structure were associated with sexual experience in adolescents. Particularly, a significantly higher sexual experience was found in the three groups living with a single parent, step-parents and no parents compared with the group living with both parents in family structure.

Conclusions This study demonstrated the factors associated with adolescents' sexual experience based on the biopsychosocial model. Further research and policy strategies that consider supporting family communication and mental health and preventing substance use are required to prevent adolescents' sexual health.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The data were weighted according to stratification and cluster variables for school and class to ensure the representativeness of the adolescents in Korea.
- ⇒ Biological factors, psychological factors and social factors were included as variables based on biopsychosocial model and analysed.
- ⇒ It is difficult to determine causal associations as a cross-sectional study.
- ⇒ The variables used in this study were limited to questionnaires based on the Korea Youth Risk Behavior Web-based Survey.

INTRODUCTION

Adolescence is the important period of transition from childhood to adulthood.¹ Adolescents experience physical, behavioural, cognitive, psychological and emotional-social changes. As physical growth and sexual maturity occur during this period, sexuality and gender identity are established.¹

In Korea, approximately 5% of adolescents have had sexual experiences.² The age of onset of sexual experience is reducing,² and the prevalence of recent sexual experience has been increasing in both boys and girls aged 12–13 years.³ According to a report by the Youth Risk Behavior Surveillance System in the USA, approximately 38% of high school students have sexual experience in the USA.⁴ For adolescent women aged 16–19 years, the rates of sexual experience in the USA and Britain were approximately 49% and 65%, respectively.⁵ Compared with Western countries, the sexual experience rate of adolescents in Korea is relatively low. This finding is similar to those observed in Asian countries. The sexual experience rates were 5.3%–5.8% and 19.1%–11.4% for 10th and 12th-grade adolescents in Taiwan,⁶ respectively; 19.9%

for Japanese adolescents living in Hawaii⁷; and 7.0% for Chinese senior high school students.⁸ These sex-related phenomena are closely associated with social norms. For example, Korea is conservative about sex due to the influence of Confucian culture, especially for women. In particular, the sexual experiences of young women or unmarried single women have negative connotations, such as social stigma.⁹ With a culture similar to that of Korea, China is not favourable to sexual experiences before marriage.¹⁰

Several studies have reported that early adolescent sexual experiences are associated with adverse behaviours and health outcomes.¹¹ Approximately 50% of Korean adolescents responded that they use contraception during sexual intercourse,² and their sexually transmitted infection (STI) rate was reported to be approximately 10% (male 9.0%, female 11.4%).¹² Among high school students in the USA, the percentage of high school students who wear condoms during intercourse has decreased over 10 years (61% in 2009 to 54% in 2019), suggesting an increased risk of STIs and AIDS.⁴ Furthermore, about 50% of new STIs were reported in adolescents and young adults aged 15–24.^{13 14} Adolescents are particularly vulnerable to STIs, such as *Chlamydia trachomatis* and human papillomavirus infection, due to a lack of cervical mucus and are more likely to engage in risky sexual activities without a condom or concurrent partners.^{13 15} Also, the onset of sexual experience at an early age is associated with unplanned pregnancy and physical violence.^{5 11} According to the Korean sexuality survey, the age of sexual debut before the age of 19 was associated with a higher number of sexual partners in life, and the number of pregnancies and experiences of sexual abuse were significantly higher among women.¹⁶

Sexual experience in adolescence is a complex behaviour that is affected by various factors and needs to be considered at multiple levels. Adolescent sexual experience is sexual maturity at the biological level and is important at the psychological and social levels.¹⁷ The biopsychosocial model is useful for understanding individual medical conditions through the complex interaction of biological factors, such as genetic and biochemical factors; psychological factors, such as mood, personality and behaviour; and social factors, such as cultural, familial, socioeconomic and medical factors.¹⁸ The biopsychosocial model was used to elucidate the chronic behaviour problem¹⁹ and the relationship between cognitive, physiological and behavioural stress responses in adolescents.²⁰ A study reported that the biopsychosocial model was used to identify factors influencing health and complaints in children and adolescents.²¹ Furthermore, a biopsychosocial model of hypersexuality in girls with bipolar disorder examined the factors associated with sexual experiences and provided a framework for cognitive-behavioural intervention.²²

Therefore, this study aimed to investigate the factors associated with adolescents' sexual experience based on the biopsychosocial model. Furthermore, this study

provides basic data on the prevention and management of risky sexual behaviours among adolescents in Korea.

METHODS

Study design and participants

The study used data from the 2017 to 2020 Korea Youth Risk Behavior Web-based Survey (KYRBS), Ministry of Health and Welfare, Centers for Disease Control and Prevention Agency. The KYRBS is a cross-sectional, nationwide survey targeting Korean adolescents, including middle school and high school students, and has been conducted annually since 2005 to identify their health behaviours. The KYRBS participants were selected using a complex sample design. The sampling process consisted of three steps: population stratification by regional and school characteristics, sampling distribution by proportional allocation methods (400 middle schools and 400 high schools) and sampling by stratified cluster sampling (school and class units). The participants responded to an anonymous self-report online survey. If the designated school agreed to participate in the survey and the students voluntarily agreed by clicking the participation button in the online survey, the survey began.² In addition, consent for some questions (family members, parents' cohabitation status, etc) in the survey was added in 2019. In this study, we used data from the KYRBS (2017–2020) because the survey questions on sexual experience have been modified since 2017. The participant response rates for the survey ranged from 94.9% to 95.8% from 2017 to 2020.

Measures

To assess the factors associated with the sexual experiences of adolescents, the variables were classified into three categories (biological, social and psychological factors) based on the biopsychosocial model (figure 1).

Sexual experience

Sexual experience was defined as having had sexual intercourse (oral, anal, vaginal) in one's lifetime, and it was measured through the following question: 'Have you ever had sex before?' The answers were 'I have had sex before' or 'I have never had sex before'.

Biological factors

For the biological variables, we included participants' age and sex.

Psychological factors

To assess the psychological variables, the levels of perceived stress and suicidal thoughts were assessed. The perceived stress level was identified through the following question: 'How much stress do you usually feel?' Participants were able to choose one of the five answers from 'very high' to 'very low'. The question on suicidal thoughts was the following: 'Have you attempted suicide in the last 12 months?' The participants responded with 'yes' or 'no'.

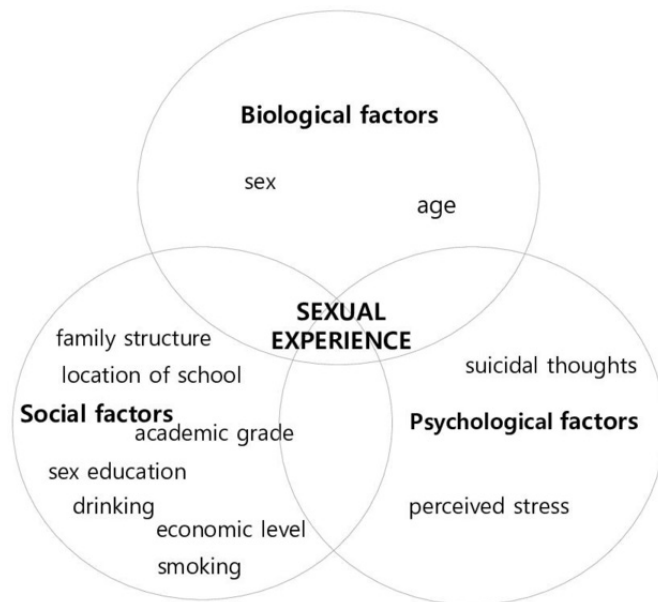


Figure 1 Illustration of the biopsychosocial model used in our study.

Social factors: family structure

Family structure was categorised based on answers concerning current family members (biological parents and step-parents) and whether the participants lived with these family members. Depending on whether the biological parent was a family member (living together, not living together) or not a family member (absence of biological parents) or whether the step-parent was a family member (living together, not living together), we finally categorised family structure into four types: living with (1) both parents (the participant lives only with a biological father and a biological mother regardless of the presence of step-parents), (2) a single parent (the participant lives only with a biological father or a biological mother regardless of the presence of step-parents), (3) step-parents (the participant lives with a biological father and a stepmother, a biological mother and a stepfather, a stepmother and a stepfather, a stepmother, or a stepfather regardless of the presence of biological parents and step-parents), and (4) none (absence of biological parents, or even in case of the presence of biological parents or step-parents, they do not live together).

Social factors: other variables

Participation in sex education was assessed using the following question: ‘Have you received sex education at school (including class time, broadcasting education, and auditorium education) within the past 12 months?’ The answers were ‘yes’ and ‘no’. The participants’ academic grades in the last 12 months, the location of the school (rural area, medium and small city, and big city) and perceived economic level of the household were measured. Behaviours towards drinking and smoking were measured by asking the participants whether they had ever drunk (or smoked) in their lifetime.

Statistical analysis

To consider a complex sample design of the study, the data were weighted according to stratification and cluster variables for school and class using SAS software (V.9.4; SAS Institute), and p values <0.05 were considered statistically significant. Items with missing values were removed before the analysis. The participants’ sexual experience characteristics were calculated using the χ^2 test and simple regression analysis. A simple logistic analysis was conducted to identify the association between sexual experience and the variables. The results are presented as the crude OR and CI. After adjusting for the potential confounding variables to avoid bias, we carried out a multiple logistic analysis presented by adjusted OR (aOR) and CI to identify the variables associated with sexual experience.

Patient and public involvement

Patients and/or the public were not involved in the design or reporting of this study.

RESULTS

The participants included in this analysis were 119459 middle school students and 115108 high school students. [Table 1](#) shows the general characteristics of the study participants according to sexual experience. Regarding the biological factors, the mean age of participants who had sexual experience was 13.9 years in middle school students and 16.8 years in high school students. 3.4% of boys and 1.6% of girls attending middle school had sexual experience, showing a significant difference. Also, 10.4% of boys and 5.1% of girls attending high school had sexual experience ($p<0.001$). Psychological factors, including perceived stress and suicidal thoughts, showed a significant difference with sexual experience. In particular, 5.6% of middle school students and 14.1% of high school students who had sexual experiences showed suicidal thoughts. Furthermore, in terms of the social factors, there was a significant difference in sexual experience according to family structure ($p<0.001$). Among middle school students, the percentages of participants who had sexual experience were 2.0%, 2.9%, 5.4% and 13.6% in those who lived with both parents, a single parent, step-parent and none, respectively. Among high school students, the percentages of participants who had sexual experience were 6.5%, 10.4%, 17.5% and 21.5% in those who lived with both parents, a single parent, step-parent and none, respectively. Most participants received sex education at school over the past year (82.3% and 71.9% of middle school and high school students, respectively, data not shown), and there was a significant difference between sex education and sexual experience. For both middle school and high school students, sexual experience was higher among participants who reported drinking and smoking behaviours.

The results of examining the factors associated with sexual experience are presented in [table 2](#). Regarding

Table 1 Study participants' general characteristics according to sexual experience (weighted %).

Characteristics	Middle school (n=119459)			High school (n=115108)		
	Sexual experience		P value	Sexual experience		P value
	No % (SE)	Yes % (SE)		No % (SE)	Yes % (SE)	
Biological factors						
Age, mean (SE)	13.6 (0.00)	13.9 (0.02)	<0.001	16.5 (0.00)	16.8 (0.01)	<0.001
Sex			<0.001			<0.001
Boy	96.6 (0.09)	3.4 (0.09)		89.6 (0.17)	10.4 (0.17)	
Girl	98.4 (0.06)	1.6 (0.06)		94.9 (0.13)	5.1 (0.13)	
Psychological factors						
Perceived stress			<0.001			<0.001
Very low	95.8 (0.29)	4.2 (0.29)		88.4 (0.57)	11.6 (0.57)	
Low	98.0 (0.10)	2.0 (0.10)		92.8 (0.22)	7.2 (0.22)	
Middle	97.9 (0.08)	2.1 (0.08)		93.2 (0.14)	6.8 (0.14)	
High	97.6 (0.09)	2.4 (0.09)		92.5 (0.17)	7.5 (0.17)	
Very high	94.8 (0.23)	5.2 (0.23)		87.8 (0.34)	12.2 (0.34)	
Suicidal thoughts			<0.001			<0.001
No	97.9 (0.06)	2.1 (0.06)		93.0 (0.12)	7.0 (0.12)	
Yes	94.4 (0.21)	5.6 (0.21)		85.9 (0.35)	14.1 (0.35)	
Social factors						
Family structure*			<0.001			<0.001
Both parents	98.0 (0.06)	2.0 (0.06)		93.5 (0.13)	6.5 (0.13)	
Single parent	97.1 (0.16)	2.9 (0.16)		89.6 (0.28)	10.4 (0.28)	
Step-parent	94.6 (0.69)	5.4 (0.69)		82.5 (1.07)	17.5 (1.07)	
None	86.4 (0.93)	13.6 (0.93)		78.5 (0.90)	21.5 (0.90)	
Sex education			<0.001			0.049
No	96.3 (0.15)	3.7 (0.15)		91.8 (0.20)	8.2 (0.20)	
Yes	97.7 (0.06)	2.3 (0.06)		92.3 (0.14)	7.7 (0.14)	
Academic grade			<0.001			<0.001
Low	96.9 (0.11)	3.1 (0.11)		90.5 (0.18)	9.5 (0.18)	
Middle	98.1 (0.08)	1.9 (0.08)		93.8 (0.15)	6.2 (0.15)	
High	97.5 (0.09)	2.5 (0.09)		92.5 (0.18)	7.5 (0.18)	
Location of school			0.731			0.096
Rural area	97.7 (0.25)	2.3 (0.25)		91.4 (0.54)	8.6 (0.54)	
Medium and small city	97.5 (0.09)	2.5 (0.09)		92.4 (0.18)	7.6 (0.18)	
Big city	97.4 (0.09)	2.6 (0.09)		91.9 (0.20)	8.1 (0.20)	
Perceived economic level of household			<0.001			<0.001
Low	96.0 (0.19)	4.0 (0.19)		89.2 (0.26)	10.8 (0.26)	
Middle	98.1 (0.06)	1.9 (0.06)		93.9 (0.13)	6.1 (0.13)	
High	97.1 (0.09)	2.9 (0.09)		91.1 (0.19)	8.9 (0.19)	
Drinking			<0.001			<0.001
No	98.6 (0.05)	1.4 (0.05)		97.4 (0.08)	2.6 (0.08)	
Yes	94.2 (0.16)	5.8 (0.16)		87.1 (0.20)	12.9 (0.20)	
Smoking			<0.001			<0.001

Continued

Table 1 Continued

Characteristics	Middle school (n=119459)			High school (n=115108)		
	Sexual experience		P value	Sexual experience		P value
	No	Yes		No	Yes	
	% (SE)	% (SE)		% (SE)	% (SE)	
No	98.3 (0.05)	1.7 (0.05)		96.0 (0.08)	4.0 (0.08)	
Yes	86.3 (0.45)	13.7 (0.45)		74.7 (0.36)	25.3 (0.36)	

*The column included missing data (n=31406), including those who disagreed to respond to the survey on family members and those who responded by living with both their biological father and stepfather.
SE, standard error.

the biological factors, sexual experience increased significantly with increasing age (aOR=1.31, 95% CI 1.28 to 1.33), and it was lower in girls than in boys (aOR=0.64, 95% CI 0.60 to 0.68). Regarding the psychological factors, participants with suicidal thoughts showed significantly higher sexual experience compared with students who did not intend to commit suicide (aOR=1.73, 95% CI 1.63 to 1.83). Regarding the social factors, particularly family structure, sexual experience was significantly higher in the group living with step-parents (aOR=2.58, 95% CI 2.32 to 2.86) and no parents (aOR=1.93, 95% CI 1.68 to 2.23), followed by a single parent (aOR=1.34, 95% CI 1.26 to 1.43), compared with the group living with both parents. Among middle school students, sexual experience was significantly higher in groups living with step-parents, no parents and a single parent (aOR=2.91, 95% CI 2.37 to 3.56; aOR=1.67, 95% CI 1.24 to 2.26; aOR=1.21, 95% CI 1.07 to 1.38, respectively) than in the group living with both parents. Among high school students, a significantly higher sexual experience was also found in the three groups living with a single parent, step-parents and no parents compared with the group living with both parents. Moreover, sexual experience was significantly higher in the group with drinking and smoking experience (aOR=2.53, 95% CI 2.38 to 2.68; aOR=4.57, 95% CI 4.33 to 4.82, respectively) than in the group without drinking and smoking experience.

DISCUSSION

This study demonstrated the factors associated with adolescents' sexual experience based on the biopsychosocial model. It is important to identify the factors associated with adolescents' sexual experience to prevent adolescents' sexual health.

Regarding the biological factors, age and sex were significant factors associated with sexual experience in adolescents, including middle school and high school students. In general, adolescence is a period of physical and mental development related to sex,¹ and it is important for sexual experience. According to a trend analysis (2006–2017) on the sexual experience of Korean adolescents, the prevalence of sexual experience among 16–17-year-olds is higher than that of 12–13-year-olds,

although it has been gradually decreasing.³ Moreover, the greater rate of sexual experience of boys than girls is similar to that reported in other studies. In China, where sex is taboo, male adolescents have more sexual intentions than females.¹⁰ According to the Promoting School-Community University Partnerships to Enhance Resilience longitudinal study in the USA, female sexual experience is not acceptable to friends while male sexual experience is.²³ This suggests that Korea, like other countries, is still more tolerating of male than female sexual experience from an early age.

Regarding the psychological factors, suicidal thoughts were a significant risk factor associated with sexual experience in adolescents. A study reported that there was a strong association between adolescent sexual orientation and suicidal thoughts and behaviours in a US national longitudinal study on adolescents' health.²⁴ Sexual experience was associated with an increased risk of suicide attempts in adolescents.²⁵ Several studies have reported mechanisms for explaining the association between sexual experience and suicidal thoughts and attempts; however, it is still unclear.²⁵ Thus, further research is needed to explain the association between sexual experience and suicidal thoughts and attempts and suggest aggressive suicide prevention interventions that recognise the risk factors for early sexual experience.

Regarding the social factors, sex education (in high school), drinking, smoking and family structure were associated with sexual experience in adolescents. Sex education has been reported as one of the ways to prevent risky sexual behaviours and promote healthy and responsible sexuality.²⁶ In particular, sex education has a protective effect against risky sexual behaviours in adolescents who have sexual curiosity and engage in unsafe sexual intercourse and consequences, such as STIs and unintended pregnancies.²⁷ A study reported that the intervention group who received sex education had better knowledge of sexual health and engaged in less risky sexual behaviours than the control group.²⁸ However, in our study, there was a positive association among high school students. This finding may be closely related to the high school educational environment in Korea. In the education system designed for college admissions,

Table 2 Factors associated with sexual experience in adolescents

Characteristics	Sexual experience (Yes vs No)					
	Total		Middle school		High school	
	cOR (CI)	aOR (CI)	cOR (CI)	aOR (CI)	cOR (CI)	aOR (CI)
Biological factors						
Age	1.49 (1.47 to 1.52)	1.31 (1.28 to 1.33)	1.51 (1.44 to 1.59)	1.27 (1.21 to 1.33)	1.36 (1.32 to 1.40)	1.26 (1.23 to 1.30)
Sex						
Boy	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Girl	0.48 (0.45 to 0.50)	0.64 (0.60 to 0.68)	0.46 (0.42 to 0.50)	0.50 (0.46 to 0.56)	0.48 (0.45 to 0.51)	0.69 (0.64 to 0.73)
Psychological factors						
Perceived stress						
Very low	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Low	0.61 (0.55 to 0.69)	0.72 (0.63 to 0.81)	0.51 (0.42 to 0.62)	0.68 (0.55 to 0.84)	0.64 (0.56 to 0.74)	0.74 (0.63 to 0.86)
Middle	0.64 (0.57 to 0.71)	0.72 (0.64 to 0.81)	0.54 (0.45 to 0.64)	0.74 (0.61 to 0.89)	0.59 (0.52 to 0.67)	0.71 (0.62 to 0.83)
High	0.75 (0.68 to 0.84)	0.72 (0.64 to 0.81)	0.64 (0.54 to 0.77)	0.74 (0.60 to 0.92)	0.66 (0.58 to 0.76)	0.72 (0.62 to 0.83)
Very high	1.35 (1.21 to 1.51)	0.95 (0.83 to 1.08)	1.35 (1.12 to 1.63)	1.06 (0.84 to 1.34)	1.10 (0.96 to 1.25)	0.92 (0.79 to 1.08)
Suicidal thoughts						
No	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Yes	2.26 (2.15 to 2.37)	1.73 (1.63 to 1.83)	2.70 (2.45 to 2.98)	1.84 (1.64 to 2.08)	2.22 (2.10 to 2.35)	1.72 (1.61 to 1.85)
Social factors						
Family structure*						
Both parents	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Single parent	1.73 (1.64 to 1.83)	1.34 (1.26 to 1.43)	1.47 (1.30 to 1.66)	1.21 (1.07 to 1.38)	1.69 (1.59 to 1.80)	1.38 (1.29 to 1.48)
Step-parent	5.20 (4.77 to 5.67)	2.58 (2.32 to 2.86)	7.78 (6.64 to 9.11)	2.91 (2.37 to 3.56)	3.96 (3.57 to 4.39)	2.49 (2.21 to 2.80)
None	3.16 (2.79 to 3.58)	1.93 (1.68 to 2.23)	2.81 (2.15 to 3.68)	1.67 (1.24 to 2.26)	3.07 (2.66 to 3.55)	2.03 (1.73 to 2.38)
Sex education						
No	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Yes	0.75 (0.71 to 0.79)	1.00 (0.95 to 1.05)	0.61 (0.55 to 0.67)	0.75 (0.68 to 0.84)	0.95 (0.90 to 1.01)	1.07 (1.01 to 1.13)
Academic grade						
Low	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Middle	0.61 (0.58 to 0.65)	0.87 (0.83 to 0.93)	0.61 (0.55 to 0.68)	0.97 (0.86 to 1.09)	0.64 (0.61 to 0.68)	0.85 (0.80 to 0.91)
High	0.65 (0.61 to 0.68)	0.97 (0.92 to 1.02)	0.75 (0.68 to 0.82)	1.07 (0.96 to 1.19)	0.76 (0.71 to 0.80)	0.94 (0.88 to 1.00)
Location of school						
Rural area	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Medium and small city	0.87 (0.76 to 0.99)	1.00 (0.88 to 1.12)	0.97 (0.77 to 1.24)	0.97 (0.76 to 1.23)	0.88 (0.75 to 1.02)	1.01 (0.88 to 1.16)
Big city	0.92 (0.81 to 1.05)	1.12 (1.00 to 1.26)	1.00 (0.79 to 1.27)	1.04 (0.82 to 1.31)	0.92 (0.79 to 1.08)	1.16 (1.01 to 1.32)
Perceived economic level of household						

Continued

Table 2 Continued

Characteristics	Sexual experience (Yes vs No)					
	Total		Middle school		High school	
	cOR (CI)	aOR (CI)	cOR (CI)	aOR (CI)	cOR (CI)	aOR (CI)
Low	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Middle	0.48 (0.45 to 0.51)	0.79 (0.74 to 0.84)	0.46 (0.41 to 0.52)	0.82 (0.71 to 0.94)	0.55 (0.51 to 0.58)	0.79 (0.74 to 0.85)
High	0.63 (0.59 to 0.66)	1.14 (1.07 to 1.21)	0.70 (0.62 to 0.79)	1.22 (1.06 to 1.39)	0.79 (0.74 to 0.85)	1.12 (1.04 to 1.21)
Drinking						
No	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Yes	6.19 (5.88 to 6.52)	2.53 (2.38 to 2.68)	4.33 (3.97 to 4.72)	2.16 (1.96 to 2.38)	5.48 (5.12 to 5.86)	2.70 (2.51 to 2.91)
Smoking						
No	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Yes	10.07 (9.62 to 10.55)	4.57 (4.33 to 4.82)	9.48 (8.66 to 10.36)	4.21 (3.78 to 4.69)	8.18 (7.75 to 8.64)	4.68 (4.40 to 4.97)

*The column included missing data (n=31406) including those who disagreed to respond to the survey on family members and those who responded by living with both their biological father and stepfather.
aOR, adjusted odds ratio; CI, confidence interval; cOR, crude odds ratio.

health education for sex is relatively insignificant.²⁹ Thus, even if high school students receive sex education, it is difficult to expect positive outcomes related to sexual health. Drinking and smoking are risk factors that influence adolescent sexual experiences. Consistent with our findings, several studies have reported that risky sexual behaviours are strongly associated with risky health behaviours.^{8 30} A study of high school students in China reported that cigarettes and illegal drugs were related to unprotected sex without wearing condoms.

Adolescents with a family structure and living with their parents had significantly less sexual experience than those with step-parents, single parents and no parents. Family structure is a very important factor in adolescent physical and psychological development and health behaviours³¹; in particular, the support of parents can help their children engage in healthy sexual activity. A meta-analysis reported that parental monitoring delayed the onset of sex and increased the use of condoms and contraceptive practices during sexual intercourse.³² Similarly, a Kenyan study reported that the presence of parents influences the first sexual experience,³³ and communication with the mother is associated with a delay in the onset of sexual experience in male adolescents.^{33 34} Conversely, adolescents who belong to a family where parental support may be insufficient are more likely to engage in risky sexual behaviours.³⁵ Several studies have reported that difficulty in communicating with step-parents affects adolescent sexual behaviours and is associated with increased sexual activity.^{36 37} In stepfamilies and single-mother families, adolescents are more likely to have sexual intercourse before they are 14 years old.³⁸ Since sex education by parents can play an important role in sexual health, active interventions tailored to the family structure are required.

This study had some limitations. First, the study design was cross-sectional and could not be used to determine causal relationships. Second, a self-report questionnaire was used; thus, the reliability of the study results may be low. However, since the survey was conducted anonymously, it can reduce the burden of respondents for sensitive questions that they may be reluctant to answer, particularly sex-related questions. Third, the variables used in this study were limited to questionnaire items based on the KYRBS. Several sex-related questions were deleted or revised from the 2017 survey, and it was not possible to analyse important variables related to this study (such as the prevalence of STIs, contraceptive practices, contraceptive methods and age at first sexual intercourse). Family structure and communication with family members are closely related to the sexual behaviours of children; however, there were no survey items about whether the participants lived with siblings or the depth of communication with parents and siblings. Finally, there was a lack of definitions for the survey items. For example, for sexual experience, there was no distinction between heterosexual and homosexual intercourse and what the method (oral, anal or vaginal intercourse) was. In addition, regarding sex education, the content and time of participation in sex education were not included. Therefore, the effectiveness of sex education may not have been accurately analysed. Despite these limitations, since this study surveyed middle school and high school students nationwide using a complex sample design, our findings could be generalised to Korean adolescents. Since the biopsychosocial model was used to identify factors related to sexual experience, the findings can be presented as objective evidence and intervention strategies based on each dimension.

This study has several implications. This study aimed to determine the sexual experience rate of Korean adolescents and related factors based on the biopsychosocial model, which suggests a multifaceted intervention strategy for their sexual health and prevention of risky sexual behaviours. In addition, considering that the divorce rate in Korea is rapidly increasing,³⁹ this study suggests the need for active intervention for adolescents who do not live with their parents.

CONCLUSION

This study identified the factors associated with adolescent sexual experiences based on the biopsychosocial model. Biological (age and sex), psychological (suicidal thoughts) and social (sex education, drinking, smoking and family structure) factors were related to sexual experiences. Based on these factors, we suggest that further research to develop and evaluate the strategy related to these factors should be conducted to promote adolescent sexual and reproductive health in the future.

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ORCID iDs

Ka Young Kim <http://orcid.org/0000-0003-3705-6449>

Hye Young Shin <http://orcid.org/0000-0002-5353-8897>

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